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A

TREATISE

ON

FOREIGN BODIES

IN

SURGICAL PRACTICE

BY

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VOLUME I.

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PREFACE.

No surgeon has hitherto thought of collecting in one book all the material which is scattered throughout the annals of science concerning the question of foreign bodies. However, there are few subjects which are more worthy of attracting the serious attention of practitioners. All those who have been brought in contact, in the course of their practice, with the numberless difficulties produced by the presence of foreign bodies, know how uncertain the diagnosis often is, how sudden are the symptoms, and how often the treatment requires skill, address, and varied and extensive learning. The treatises and journals are also, in some sort, encumbered by the interesting cases which have accumulated for centuries, although no one has drawn practical deductions from them, or has rendered them useful in surgery.

The pathology of foreign bodies has, undoubtedly, not arrived at that stage of perfection toward which the efforts of lovers of our art tend. But is it not worth our while to endeavor to collect all these materials in one work, to make a synthesis of the notions which have been slowly acquired, and to place landmarks in the path of progress?

Fortified by the experience of past generations, I have, therefore, undertaken a work which has no analogue in our classical literature. Apart from a few more or less complete monographs, and from a few useful, general ideas, we possess no important guide, and experience teaches that the concise precepts of our classical works are frequently insufficient to endow the surgeon with the boldness and positiveness demanded in the treatment of foreign bodies.

Take a student who has passed through all the medical grades, and is on the eve of entering civil or military service: place him in the presence of even the simplest cases of foreign bodies—a small stone or a pea in the ear, a metallic splinter in the cornea, or a catheter broken in the urethra—and the anxiety and embarrassment which he manifests will show how insufficient is his surgical knowledge on this point. He has been taught to amputate, resect, or disarticulate the limb *secundum*

artem; he knows the principal arterial trunks, and all the exceptional occurrences, but there is every reason to believe that he will be a very novice in the solution of this problem which may be suddenly presented to him, both in the city and country.

Read the thousands of curious cases published by authors, and you will see how frequently the address and ingenuity necessary to overcome the difficulties presented in such cases have been wanting, and how useful a knowledge of similar cases may be.

Amussat has written that, in order to know how to arrest a hemorrhage, it is necessary to have tied the arteries in animal vivisections. This precept, with whose justice I was struck at an early period, is equally applicable to foreign bodies. Of what use can a lithotrite, a laryngeal forceps, or an œsophageal curette be in the hand of an inexperienced practitioner, if he has not learnt its management on the cadaver and upon animals?

It would be very easy to fill up this hiatus in the curriculum by associating the didactic teachings, which are given almost solely at the present time, with methodical exercises and practical demonstrations. This is, undoubtedly, very useful to those who adopt this plan; their confidence is then not based upon illusions, which very soon vanish, and give way to numerous deceptions. They can form an accurate idea of the value and efficacy of the measures at the disposal of our surgical arsenal, which is so perfect at the present time.

This book, despite its imperfections, will be a guide in this direction, and may also be valuable to practitioners who, when thrown on their own resources, can consult it with some profit. It is for this reason that I have thought it well to publish a certain number of original cases, which will impress the reader more forcibly than the most judicious precepts.

But the work must not be looked upon as an undigested compilation of cases taken at random, or a long series of statistics with indefinite percentages. This is readily understood if we remember that authors usually publish only the curious cases, and frequently only the fortunate ones. I have not been led into the error of basing my views on a number of exceptions.

The history of foreign bodies comprises three principal groups: The first, which forms the subject of this book, involves the foreign bodies of the natural passages. The foreign bodies which enter the economy by "effraction," or are fixed to the surface of the parts, form two other groups, but they will be considered somewhat later.

I have endeavored to give a clear exposition of the various accidents produced by the arrest of foreign bodies, and to collect the various

therapeutic measures into natural groups. When I have thought it useful, I have reproduced specimens, in order to throw into relief the pathological lesions, the varieties of the foreign bodies, and especially the instruments which are chiefly in vogue in France. I desire publicly to thank my collaborator and friend, M. Dauphin, whose woodcuts adorn this work.

In conclusion, I will have attained the object of all my endeavors if this work proves of service.

A. POULET.

PARIS, December, 1879.

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TREATISE ON

FOREIGN BODIES

IN

SURGICAL PRACTICE.

PART I.—FOREIGN BODIES IN GENERAL.

CHAPTER I.

DEFINITION.—SCOPE OF THE SUBJECT.

THE term "foreign body" is a very old one in medical literature, as it was employed by the Greeks and Romans, and has been handed down from them to the present day, although it has never been clearly defined.

The conventional meaning of the term is known to all, but its exact signification is not so readily understood. At the beginning of this century, Maunoir and Delpech examined the question from the broadest point of view, and stated that all substances must be regarded as foreign bodies *which are incapable of taking part in the common life of the solids and fluids of the body.* This standpoint may be correct, but it evidently does not correspond to the idea which the majority of surgeons have formed of a foreign body. In order to tally with his premises, Delpech was obliged to include the study of parturition in that of foreign bodies. According to him, the fœtus, urinary and biliary calculi, the gas of emphysema, extravasated blood, etc., were foreign bodies, and, in this manner, he included a considerable part of pathology in his exceedingly large category.

Since Delpech's work,[1] the most complete and doctrinal which has appeared upon the subject, the various authors who have treated of foreign bodies in general in their works or in periodical publications, have endeavored to show that the definition of the Montpelier surgeon was much too large and too theoretical, and that it did not meet the demands of practice. This tendency is especially well marked in the chapter devoted to this

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[1] Traité des maladies reputées chirurgicales, T. II., p. 1.

topic by the authors of the Compendium,[1] who excluded viruses, venoms, poisons, eschars, and changes in the fluids—in a word, all chemical or vital modifications of the organism.

According to them, a bullet which is lodged in the muscles, a thorn which has been buried in a limb, a bone lodged in the œsophagus, constitute the type of foreign bodies, and they expressed their new conception by means of the following definition:

"*This term (foreign body) is applied in surgery only to those solid or semi-solid substances, which do not take part in the common life of the body, and which prove hurtful rather by their size, hardness, and roughness than by the vital action which they exercise upon our tissues.*"

It is evident that the subject has been considerably restricted, but, unfortunately, this definition is insufficient because it is not sufficiently explicit, and rather shows what must be excluded from the study of foreign bodies than what it really includes.

Recently, Monod, in an excellent article in the Dictionnaire Encyclopédique,[2] has corrected the definition of the Compendium, and has rendered it more precise by including in it the fluids and gases which were omitted in the former. But why number gases among the foreign bodies when they are not regarded as such by any surgeons? Monod himself, after some remarks upon the gases and fluids, acknowledges that solid or semi-solid bodies will form "the principal object of his study, and that they will serve as types." In fact, it would be rash to attempt a subject which includes gases, vapors, fluids, solids, animate or inanimate bodies, parasites, acids, bases and salts, minute and coarse bodies. Limited to those bodies which are really foreign and proceed from without, whether solid or liquid, the subject is sufficiently large, as is evident from a review of this work, and it will be very difficult to limit this study. I therefore state that: *By foreign bodies in surgery are meant abnormal, solid, or fluid substances which have entered the body from without, which have penetrated the organism, or become fixed to its surface, and which, by their presence or mechanical action, modify the conditions of existence of the parts.*

A large number of solid or fluid substances in the economy may, under abnormal conditions, play the part of foreign bodies, but these should be excluded from this investigation. Among these, splinters of bone approach most nearly to foreign bodies, properly speaking, and, on account of the general habit of regarding them as such, they deserve special attention, as foreign bodies of traumatic origin.

This is not true, however, of the organic bodies in joints, which should, with much greater propriety, be termed arthrophytes; they will not be discussed in this work.

The classification of foreign bodies into three grand divisions, according as they enter the economy through the natural passages, by forcing a passage, or are merely fixed to the surface of the skin, is evident from the definition.

Finally, the various authors appear to regard as foreign bodies only those which are injurious to health; this is, in my opinion, a mistake, because there are some which do not give rise to accidents. Is a bullet which is tolerated in the brain for a number of years not a foreign body, as well as one which retards the cicatrization of a wound? We are only justified in stating that by their presence or mechanical action, they

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[1] Compendium de chirurgie.

[2] Dict. encyclop.: Art. Corps Étrangers.

modify the conditions of existence of the parts, that they sometimes injure them, but in other cases do not compromise their functions.

Finally, this work only refers to bodies of moderate size, and does not take into consideration either the affections produced by powders and vapors of all kinds, or the traumatisms to which a large, foreign body, such as a large stone or cannon-ball, may give rise. In addition, I will not include in this category the animals which have entered the economy fully developed, such as leeches, fish, etc. This does not imply that those which, like lumbrici, teniæ, etc., are developed in the body, do not play the rôle of foreign bodies; but they do not belong under this head of human pathology, and they act much more on account of a vital than a mechanical action.

CHAPTER II.

CLASSIFICATION.

All foreign bodies may be ranged in four grand classes, according to their origin, their mode of penetration, or fixity. These are: 1st, the bodies which penetrate the economy through the natural passages; 2d, those which penetrate by "breaking through," *i. e.*, by wounding some part of the cutaneous envelope; 3d, those which, developing in the economy after an injury, are formed at the spot where they are found; 4th, those which are adherent to parts, like rings, chains, etc. But these classes are not equally important, and the third one, which refers to very little outside of bony splinters following an injury, does not merit a special description. I will include its study in that of the bodies from "*effraction*" (breaking a way through), to which it most assimilates on numerous points.

Each of these principal classes is subdivided in its turn in the following manner:

- I. Foreign bodies introduced through the natural passages.
  - In the Splanchnic Cavities.
    - Intestinal Canal.
      - Pharynx and œsophagus.
      - Stomach.
      - Intestines.
      - Rectum.
    - Respiratory Organs.
      - Larynx, trachea.
      - Bronchi.
    - Genito-Urinary Organs.
      - Urethra.
      - Bladder.
      - Vagina.
      - Uterus.
  - In the organs of special sense.
    - Auditory canal.
    - Nasal fossæ.
  - In the glandular ducts.
- II. Foreign bodies entering by "effraction."
  - Foreign bodies in general and in the different parts of the body.
  - Foreign bodies in gunshot wounds.
  - Foreign bodies in the eye.
- III. Foreign bodies fixed to the surface of the parts.

CHAPTER III.

ETIOLOGY.

Almost all classes of foreign bodies have their special etiology, so that it will be difficult to enter here into these minute considerations. Leaving aside details, I shall devote this chapter to the predisposing influence exercised by sex, age, calling, mental condition of the patients, etc. These involve ideas which should form part of a general work, and are not devoid of interest.

Influence of Sex.

There is a great difference in the proportion of foreign bodies observed in man and woman. There are several reasons for this peculiarity, which is much more striking in adult life. In early life these reasons do not exist, but the difference appears toward the period of puberty. While man, devoting himself to manual labor, is continually exposed to traumatisms, woman, on the other hand, is shielded from them, to a certain extent, by her sedentary habits. Not alone is she not exposed, like man, to the fortunes of the field of battle, but she does not possess those habits which predispose to the entrance of foreign bodies. How often is drunkenness the cause of accidents of this character! Under the influence of this stimulation, the man engages in wagers of which his organs frequently constitute the subject and the victims. Here is an unfortunate who has swallowed a pipe or a knife on a wager; or a drunkard, rendered stupid from drink, has introduced a foreign body into his urethra!

In woman this cause does not exist; it is true that other factors tend to establish an equilibrium, but they possess less importance. Among other things, I wish to mention hysteria, an almost exclusive monopoly of which is possessed by the female sex, and which leads young girls to do the most insane acts. The cases in which pins or needles are swallowed by hysterical patients are innumerable, and in some this strange mania has led them to swallow more than a thousand objects of this kind. Nevertheless, the much greater predisposition of the male sex is indisputable, although it would be difficult to establish the exact proportion.

Influence of Age.

The influence of age upon the predisposition to the entrance of foreign bodies is a very curious study. Each age has its failings, and man is exposed to foreign bodies from early infancy to extreme old age. Follow him from birth, and you will often find him the victim of the powerful instinct which leads him to carry to his mouth everything upon which he lays hands. This cause is operative for a long time, and it is not the least important in the introduction of foreign bodies into the œsophagus, intestinal canal, and respiratory passages. Do we not see infants swallow the toys, the plates of their little sets, the whistles, marbles, beans, metal crosses, etc., etc., with which they amuse themselves? Is it not surpris-

ing to see a little child swallow the roller of a leg of the table? Nevertheless, all these things are done, and are peculiar to childhood. But this is not all, since young children are also the victims of other accidents, and of the bad habit of stuffing into the natural orifices, especially the nose and ear, everything upon which they lay hands. Hence the fact that a large proportion of the cases of foreign bodies in the nasal fossæ and external auditory meatus are observed in children, and it is not always easy to understand how a body as large as the head of a china doll can be forced into the nares of a little infant. Childhood, then, possesses an especial predisposition to foreign bodies in the natural passages, especially in those situated in the head.

With puberty appear other predisposing causes, much more numerous and serious, and which vary in the two sexes. The proportion in the natural passages diminishes sensibly in man, to yield to those occurring from "effraction." At this age the young rogues are the victims of their imprudence in playing with powder, fire-arms, etc. The vices have not yet appeared in the young man, and shameful lust does not lead him to self-abuse. There are very few examples of young people who were victims of a precocious habit, such as is found among the shepherds. If the young girl is less exposed to external causes, and to foreign bodies from "effraction," she is unfortunately much more frequently the victim of lust. Foreign bodies in the urethra and bladder are common even at this age. In youth, also, attempts at abortion are frequent, and examples of foreign bodies in the uterus also make their appearance. Despite these special predispositions of adolescence, those of adult life are equally great because all causes then act with equal intensity, according to the profession, sex, habits, diseases, etc. Drunkenness, insanity, unrestrained passions then intervene, and are superadded to the other causes, which, as in the profession of the soldier, favor the introduction of foreign bodies.

All these influences diminish as age increases and cools the passions, especially in the female sex; but, unhappily, other predispositions arise out of the infirmities even of old age. The functions are not performed as regularly as formerly, and thus constitute a source of foreign bodies. Mastication, for example, often becomes defective, and morsels of food may suffocate the unhappy patients by obstructing the air-passages and œsophagus. Or, perhaps, false teeth or portions of a plate which has been poorly set, may fall into the pharynx and give rise to serious results. Affections of the urethra and bladder are frequent in old men, and the catheters which they use in order to satisfy their needs may become broken. In the same manner the infirmities of age in women also give rise to other accidents. How often have pessaries, which were left in the vagina for a number of years, given rise to the most serious complications! Finally, we find debauched old people, led by a lewd and depraved imagination, endeavoring to revive artificial sensations by the introduction of the most remarkable foreign bodies into the rectum. In fine, all ages are represented in the long list of foreign bodies, each presenting its special predisposition.

Influence of Occupation.

It is not less interesting to follow this etiological investigation into the various callings of the patients. An entire group of bodies, which belong rather to the domain of medicine than of surgery, and which are

introduced into the air-passages, have for a long time drawn attention to the noxious influence of certain professions. I refer to that class of affections to which Charcot has given the term "pneumokonioses," and which, according to the trade, are called anthracosis, siderosis, cottony phthisis, etc. Is there any necessity for the remark that the profession of arms exposes its members to foreign bodies from effraction? In like manner every one knows how the organ of sight is exposed to splinters of stone, iron, copper, etc., in stone-blasters, mechanics, and all laborers who work in metals. Hardly a day passes in which cases of this kind do not present themselves at an eye clinic. It has also been remarked that upholsterers very often swallow the nails which they use, and these have more than once given rise to ano-rectal inflammations. I may also refer to strolling acrobats who are sometimes the victims of their own jugglery, and whose life has more than once paid the penalty of a want of skill. Either the object which they appear to swallow escapes them, or the digestive tract revolts against the bizarre exercises to which it has been subjected for a certain length of time.

Finally, all callings which isolate its members and give free rein to the imagination, predispose more than others to acts of insanity, which often lead to the introduction of foreign bodies into the rectum, and especially into the urethra. To this class belong shepherds, whose depraved habits are well known, and curious examples of which will be found in the course of this work. We must also include all persons who, like prisoners or members of monasteries, religious orders, etc., furnish a considerable contingent to the history of foreign bodies of the genital organs. Finally, there is almost always some relation between the nature of the body and the character of the individual. Thus, we rarely find, in women, any other objects than those used in their occupations, and in men, than the instruments, tools, etc., which they ordinarily employ.

Influence of a Perversion of Ideas.

When the ideas become perverted, whether temporarily or permanently, the conditions favorable to the introduction of foreign bodies are considerably increased. Under this general expression I include insanity, delirium, drunkenness, suicidal mania, and even hysteria. With the exception of drunkenness, almost all the other pathological conditions terminate in suicidal monomania, and it is for this purpose that certain maniacal patients swallow the most extraordinary objects, a list of which will be furnished at a later period. Others introduce them into all the orifices, hoping thus to achieve their object more effectually. Though they do not always succeed, the accidents which follow these strange attempts are often interesting from more than one point of view. A drunken man, while under the influence of alcohol, indulges in the most extravagant deeds, but without any marked tendency to suicide. Finally, hysterical patients present, almost exclusively, the peculiarity of swallowing pins and needles, and facts of this kind are very numerous.

To all these predisposing causes we must also add malice, lechery, volitional intent, congenital or acquired organic affections, etc., and surgical interference.

CHAPTER IV.

NATURE OF FOREIGN BODIES IN GENERAL.

Every pathological museum possesses a certain number of specimens which testify to the infinite variety of bodies which are casually found in the economy, and the tables collected by various authors, and those presented in this work, will give an idea of their diversity. They are counted by thousands, and the imagination can hardly grasp the series, so numerous and strange are its components. Nevertheless, in order to introduce some method into the following remarks, I will divide all these bodies into several groups, according as they belong to the animal kingdom or among inanimate objects.

This distinction separates from the general mass a very small number of objects, which I do not regard as real foreign bodies, viz., the animals which enter the economy fully developed. Thus, I do not think that we should range in this category the parasites of the skin, which develop and proliferate under the epidermis; the parasites of mucous membranes, which are merely the products of larvæ deposited by insects; and even the hair-worms and chigres, which differ very much from all other foreign bodies, and only present an apparent analogy to them. This study will then be reduced to a small number of curious facts which refer to the ingestion of leeches (a very frequent accident along the entire Mediterranean shore), to some cases of fishes swallowed whole, and to the ingestion of flies, frogs, bats, mice, vipers, or salamanders. But the latter animals are not included in the limits of what may be regarded as authentic, and I shall recur, in discussing the foreign bodies of the intestinal canal, to the interesting history of those first mentioned, and to the symptoms to which they may give rise.

The much larger number of foreign bodies belong, therefore, to inanimate substances, of animal, mineral or vegetable origin. These considerations are not unimportant with reference to the final symptoms, because the organism does not respond in the same manner to these three cases. Thus, the tolerance of the tissues for inert bodies of mineral origin is well known, compared to its almost absolute intolerance of bodies of organic origin. Vegetable substances hold the middle place, though they approach more closely the bodies of animal origin. On the other hand, the secretions which are found in the natural passages are not indifferent to the arrest of foreign bodies, and they may dissolve, change them, and even render them innocuous. A piece of gum arrested in the œsophagus, a large portion of food, may cease to be hurtful from the mere action of the digestive secretions. But it is especially with reference to becoming encysted from the irritation produced, that this division is justified, because bullets, for example, are encysted much more readily than wood, bone, etc.

I will pass in review successively certain of the most interesting peculiarities, in order to initiate the reader and to give him an idea of the variety in practice. I will then take in consideration the form, volume, number, consistence, and solubility of foreign bodies.

The shape of the body interests the surgeon most, because it will serve him as a guide in the choice of the therapeutic measures. If it is regular, it may assume geometrical or other forms, and this fact renders it in

general less dangerous to the organ, but also more movable. A round ball, a glass tube, a coin or a weight are the types of this class, and they may remain lodged in the natural channels without any great primary tendency toward perforation. This is even more true when the objects are irregular, because their projections force themselves into the muscles, and not only oppose displacement, but also interfere peculiarly with the functions of the parts. I would exclude from this class pointed bodies of a regular shape, such as pins, needles, the beard of ears of barley and of grass, which follow certain laws of progression and traverse the organs. Their shape plays a considerable rôle in this movement of migration, and explains those well-authenticated facts in which we find that swallowed pins may make their way to the sole of the foot. The study of the shape is not less fertile in valuable considerations with reference to the situation of the foreign bodies. Thus, the bodies which enter by breaking their way through the tissues affect two very distinct forms: they are either small and short, like bullets, or one of their diameters very markedly overbalances the other. These include thorns, pins, knife-blades, points of daggers, etc. The same types are reproduced in the natural channels of the body. When occurring in the œsophagus, urethra, or rectum, the disposition remains the same, as a rule—sometimes more marked in the elongated form (urethra), sometimes in the globular or irregular form without any predominant dimension (œsophagus).

These differences, which are very marked as regards shape, do not exclude great diversities of volume. Between a cannon-ball, several pounds in weight, which is concealed in a wound, and the fish-hook caught in the œsophagus—between the bottle or the stick twenty-five centimetres long, which the human rectum may harbor, and the grain of powder which tattoos the burned skin, there are very considerable differences. On the other hand, there is a certain proportion between the organs and the foreign bodies which establishes the maximum limit possible in them. Bodies introduced by breaking through the tissues are undoubtedly those which can most readily acquire a considerable volume, because, not being contained in a special organ, they are not circumscribed either by their manner of introduction or penetration. On the other hand, a foreign body which penetrates the urethra cannot obtain dimensions larger than those of the dilated canal, but it is very frequently of a much greater length. This is also true of the œsophagus, which does not permit the introduction of very large bodies, because the separation of the maxillæ will prevent it, and also because the œsophageal canal has very small dimensions. This question of the relation between the organ and the object is so important that a body which was evidently an obstacle in a duct does not deserve the appellation of foreign body in an adjacent organ. Is a proof required? It will suffice to refer to what occurs in the œsophagus and stomach. A chestnut or an onion arrested in the œsophagus threatens the life of the patient; the surgeon, after vain efforts at extraction, decides to push them into the stomach. As soon as they have reached the latter, a surprising relief is experienced, and the patient passes in a few moments from the greatest danger to a condition of the most satisfactory health. In addition, there are orifices which oppose the passage of foreign bodies; in this respect the pylorus and ilio-cæcal valve merit an especial attention. Finally, we may make a résumé of all that concerns this question of volume, by stating that the extreme limit is attained when the distension of the organs has arrived at its highest point. In some this elasticity is not very marked, but others, like the rectum, possess an incredible

capacity. Nothing less than the bony rim of the pelvis has put a check to the imagination of those depraved individuals who push into the anus glass tumblers, bottles, pestles, etc. An unfortunate individual has been known to attempt to break a carafe of glass, which he was unable to withdraw from his rectum, with the handle of a fire-shovel introduced into the neck of the vessel. There is nothing astonishing, then, in the fact that the vagina, an organ which is extremely flexible and dilatable, should give access to similar bodies, to boxes of preserves or pomade, goblets, compasses, etc. On the other hand, it is more difficult to understand how the sphincters can permit an equal enlargement, and the surgeon who struggles in order to pass through them, can form a good idea of the resistance which these bodies must overcome.

Very fortunately, objects of such a large size are only met with singly; but, as their size decreases, we find the bodies becoming multiple, and when they reach the lower limits they are sometimes very numerous. Moreover, some do not become injurious until they have been combined. This is true of strawberry seeds, cherry and plum pits, which form a mass in a loop of intestines. In addition, there are projectiles which are present in larger or smaller numbers, as in buckshot wounds; moreover, in one case a peasant introduced seventy snails into the anus. But substances of a very considerable size may be present in very large numbers. Every one knows the history of the convict upon whom Fournier of Brest made an autopsy, and whose stomach was immoderately dilated by fifty-two objects of various kinds which extended from the pubis to the diaphragm. Some of these objects, which weighed a pound in all, were long pieces of wood obtained from the hoops of kegs. This fact is not unique, as an entire collection of knives was found in a sailor, a number of pebbles in an acrobat, and eighteen hundred and forty-one substances in a lunatic. In the course of this work will be found numerous cases of this kind, which are similar to those of which certain needle-eaters possess a specialty. More than a pound of needles has been found in the stomach and intestines of one of the latter class.

It would be an error to believe that the intestinal canal possesses a monopoly of this multiplicity, since these facts are also observed, although to a less extent, in other channels. The bladder, for example, has been the receptacle of several foreign bodies at the same time, which have either been successively pushed into the urethra by some unfortunate, or by a masturbator who, in despair, had attempted unsuccessfully to withdraw by hooks, etc., a body which he had previously introduced. Finally, in certain wounds from the powder discharged by a cannon, the grains of powder are incrusted in the skin by thousands, and really form tattooing.

The discussion of the consistence gives rise to certain considerations to which I will return in speaking upon treatment. Certain bodies are very hard, like stones, iron, lead, brass, and cannot be broken, while others, like leather, mushrooms, portions of clothing entangled by bullets, etc., are very soft. Hence there are numerous difficulties in discovering and investigating them; some are hard and can neither be bent nor broken; others are flexible, like a leather belt, a rubber bougie, or metal wire, and can be bent. Each variety, therefore, demands special therapeutic indications and instrumental measures. A large number of foreign bodies deserve the entire attention of surgeons, merely from their composition. Thus, substances made of glass should never be broken, because the splinters are extremely dangerous. For this reason it has become necessary, on more than one occasion, to resort to forceps for the

extraction of glasses from the rectum or vagina, or to perform lithotomy upon patients who had introduced the tube of a barometer or thermometer into the bladder. Finally, in a general study we must also take into consideration the degree of friability of the objects, because this circumstance may be useful, either with regard to the question of breaking them by means of special instruments, or if we desire to crush them by means of pressure (œsophagus), etc.

I can dismiss the solubility of certain substances in almost complete silence, since surgeons have not attempted to utilize this property with a view to treatment. Ledrau had attempted to dissolve a piece of leaden sound in the bladder by the aid of mercury; others have attempted to lessen the roughness of metallic foreign bodies which had been swallowed. More recently, Leroy d'Etiolles, Nélaton in France, and other surgeons have attempted to solve the problem of dissolving wax by injections of naphtha into the bladder. All these laudable attempts would have met with more success if the reactions occurred in the economy as they do in the test-tubes of the chemist. Nevertheless, remedies have been successfully employed in some cases, in order to soften the foreign bodies. The administration of vinegar has succeeded in softening the bones of a fish which had lodged in the œsophagus and could not be displaced, and certain flat bones may perhaps be softened by the administration of acidulated drinks.

I will not leave this subject without alluding to the fact that certain bodies, by the imbibition of organic fluids, are capable of swelling and assuming a much larger volume than they previously had; sponges are of this nature. Others, as the various grains, may, from contact with moisture and heat, find a place favorable to fermentation, and the beginning of germination may be manifested. Phenomena of this nature are produced in the case of beans which have lodged for a certain length of time in the bronchi, and when cherry-pits are arrested in the cæcum, etc. Finally, some metallic substances like iron are attracted by the magnet, and this property has been more than once employed for the discovery or extraction of some substances situated either deeply or very superficially (the eye).

CHAPTER V.

THE MANNER OF INTRODUCTION.—SITUATION.—MOBILITY.—FIXITY.

There are such marked differences between the foreign bodies which enter through the substance of the tissues, and those introduced into the natural passages, that it is necessary to study them separately. I will commence with the manner of introduction of those first mentioned, which may be present in all parts of the economy, either as the result of the action of fire-arms, or which may have pushed in by any force whatever. In truth, the manner of action does not differ in both these cases; nevertheless, the special nature of the foreign bodies which may accompany gunshot wounds, and the enormous force which propels the projectile, gives them a peculiar type. Sometimes there is merely a more or less deep cul-de-sac with a single aperture of entry; sometimes there is a complete

canal which passes through the body. In both cases there is a solution of continuity of the tissues, which present characteristics essentially different from those of the openings made by blank cartridges. Moreover, the wound by which the point of a dagger or the blade of a knife has entered, is not so contused or swollen as that made by a bullet or a splinter of shell. Hence the origin of important differences, both with regard to their development and treatment. Furthermore, different anatomical conditions will result, according as the offending body in the wound is sharp or blunt. The point of the dagger separates the tissues, the blade cuts them, the bullet drives them asunder and destroys them.

Hitherto, I have supposed that these bodies only act upon the soft parts; how much more evident do these facts become when we take into consideration the foreign bodies which penetrate the osseous tissues! If the body is tapering and pointed, it breaks the bone, burying itself into its substance, if it is not too hard or thick. Daggers, foils, or needles may, in a manner, be solidly imbedded in the cranium and ribs.

A cutting instrument is generally arrested if it is not pointed, because the bone is not readily incised. But the most interesting lesions are especially produced by blunt objects which are thrown with great force, like projectiles. These include the comminuted fractures, and the peculiar perforations, complete or incomplete, with concussion at a distance, as shown by cracks or fissures. To a less degree, they include the solid incrustations upon the surface or in the substance proper of the bones. The chapter upon foreign bodies in gunshot wounds is rich in similar facts.

Fire-arms also present other interesting considerations with regard to penetration. I wish to speak of the manner of indirect penetration, which accounts for the introduction into the economy of the various bodies which the projectiles have entangled in their passage. Such are the fragments of cloth derived from the clothing, pieces of the equipment, portions of the body of bystanders, stones and sand which strike the parts from the ricochet. This chapter is full of the most curious details. We must also add the influence of deviation and fragmentation.

It is not astonishing that foreign bodies from gunshot wounds should penetrate in all directions, and I know of no part of the economy in which bullets have not been found, whether it was the lungs, heart, brain, or limbs. The other bodies are not situated in such varying localities, and the examples of blades encysted in the chest, lungs, etc., are curiosities, even up to the present time.

After the preceding remarks, we can readily comprehend that we cannot establish any rule with regard to the mobility or fixity of the bodies which have entered the tissues.

Some, in fact, are so solidly imbedded that, though the inventive spirit of instrument-makers has been laid under contribution in order to extract them, all tractions have failed when bodies, like the bayonet of a musket, were bent into the bones. Hence, we find as able a surgeon as Ravaton striving for an hour to render movable and to extract, by means of strong forceps, a splinter of shell which was firmly imbedded between the tibia and fibula. And it is not only between resisting bones like the preceding that this retention may occur, despite the address of the operator, but a ball imbedded between the plates of the ethmoid may not be able to be withdrawn except after the employment of an enormous amount of force.

Not only is it necessary to invent new instruments, but surgeons must also resort to ingenious, but very radical procedures, in order to render movable, or to extract, the bodies which have lodged in the bones. Thus

the older writers advised the application of the crown of a trephine around the point at which the body was fixed. It has been necessary to do this more than once upon the skull, vertebral column, etc.

Sometimes the fixity proceeds from the elasticity of the tissues: a ball imbedded between the patella and femur can be dislodged only after very extensive incisions. But as a rule, the substances which are arrested in the soft parts are susceptible of a certain mobility, either because they change their position during the movements of the part, or because some displacement can be effected by the hand. Moreover, this is the origin of the changes in position which are usual in some bodies, such as pins, needles, and even bullets. This mobility attains its maximum when a regularly rounded body is lodged in a serous cavity, and in an organ which is hollow or filled with fluid. The older surgeons founded upon this mobility a plan for the treatment of wounds of the chest or abdomen, in which the offending substance had been retained. They placed the wounded patient between two tables and moved him about, with the hope that the foreign body would present itself spontaneously. This mobility also explains the difficulty experienced in the exploration of joints which are the seat of projectiles. Finally, gravity also exercises its rights upon bodies floating either in serous cavities or hollow organs, and, in endeavoring to find them, we must direct our attention to the lowest portions of the organs. It is for this reason that Larrey and Banden have established a place of election in searching the infero-posterior portion of the thorax, in order to extract foreign bodies which have fallen into the pleura.

The symptoms do not occur in the same manner in foreign bodies which have been observed in the channels of the human body. Generally, force has not been employed, and, save a few exceptions, we find no examples of violent introduction. The case in which a cork was pushed down the œsophagus of a man who was trying to open a bottle of champagne with his teeth, and those in which flying-fish have been arrested in the same canal, belong to the exceptions. We can also add to these the forced introduction of large bodies into the rectum, in cases of falls upon the buttock. But these facts are very rare, compared to the majority in which we find that the hand of the patient has performed the introduction without great resistance. Moreover, the largest number are the victims of an accident, and there is no necessity for the display of force in order to swallow a bone concealed in the food, or to inspire a bean or some other foreign body which lodges in the larynx or trachea.

Here other forces intervened to produce movements of the objects situated in the passages which have swallowed them, so to speak. It is a curious fact that all the natural channels, either by their function or by a peculiar arrangement, tend to draw the objects onward. Do you wish illustrations?

I will refer to the urethra, the "absorbing" tendency of which is unknown to none, and which very readily passes the bodies which it contains into the bladder. This fact is so important with regard to foreign bodies in the bladder that three-fourths of the cases result from it. I will also cite the centripetal action of the œsophagus, which acts in spite of the individual, and treats a foreign body as it does an alimentary bolus. We must also mention the power of thoracic aspiration, which draws in the air and the particles which it contains, the peculiar action of the levator ani muscle, etc. There is not even a canal so small or an opening so narrow as that of Wharton's duct, which cannot be penetrated by foreign

bodies. Illustrations will be found in this work, in the chapter upon glandular ducts.

The active influence of the walls plays an important rôle in the manner of penetration of those bodies which are accidentally present in the ducts.

Hence, such foreign bodies do not possess a definite position, since some are arrested at a point at which they are retained by their physical properties or the action of the walls, while others are essentially movable and may produce the most serious accidents without becoming fixed; movable bodies in the trachea are of this nature. Nevertheless, there are places of election in which the objects are arrested by preference, and, as a rule, these are determined by the normal narrowing of the ducts or by some anatomical arrangement. Thus, the ring of the cricoid cartilage, the pylorus, the ileo-cæcal valve and internal sphincter, are the places of "election" in the intestinal tract; in a similar manner the large majority of bodies which are arrested in the air-passages become fixed in the larynx or right bronchus. I shall give the reasons at a later period, restricting myself at this time to a statement of the diagnostic and therapeutic sequences which the knowledge of these facts may have.

To say that these points are the places of election for foreign bodies, means that when found here they are almost always fixed, whether they are regular or irregular in shape; for, on account of the tendency of the canals to produce progression of the bodies which they enclose, the arrest of the latter must be due to the fact that they have encountered some obstacle to displacement. But after having been movable for a certain length of time, the objects may become stationary, if their rough points no longer appear under favorable conditions. We may also find the objects stationary even beyond the points of election. Roughness of the objects evidently increases the chances of fixity, because the projections become engaged in the mucous membranes and cannot be readily withdrawn. Swallowed fish-hooks constitute the most perfect type; then follow wire, hair-pins, prickly berries, etc. On the other hand, the narrower and more inextensible the duct which contains the object, the greater will be its relative fixity; to this class belong all the glandular ducts, the œsophagus, urethra, etc. On the contrary, the channels which present a large lumen like the intestines, stomach or bladder, present examples of the greatest mobility. The dimensions or volume of the objects must be very large in order that they may become fixed: in the stomach they consist of forks, knives, etc.; in the bladder, of long, pointed objects which penetrate the contracted walls; finally, certain ones may be movable in one direction, but not in another, such as pins, needles, the beard of rye, wheat, etc. Hence the facility with which they penetrate the tissues, and, by a latent migration, may approach the skin. The examples of wandering leeches, which move about in the ducts, are very rare, if not purely imaginary, and have not been often verified.

CHAPTER VI.

THE CONDITION OF FOREIGN BODIES.

"Every substance, whatever its origin, situated within the parenchyma of our organs, without forming part of its natural constituents, must either be incessantly penetrated by vital processes and undergo organization, or destroyed by the action of the absorbent system, or eliminated in some manner; or it may produce a considerable change in the organization of the adjacent parts in order to be tolerated without inconvenience. In other terms and in four words, every foreign body is organized, absorbed, eliminated or encysted." [1]

Delpech thus looked at the question from a philosophical point of view, which is perhaps in accordance with his definition of foreign bodies, but is surely incompatible with practical ideas. No foreign body has ever been organized or absorbed, and the recent observations of Fleming,[2] which tend to prove the innocuousness of certain organic substances of animal origin, are too inconclusive to militate against this principle. Delpech found himself constrained by the vast extent of his topic to enunciate general laws, which do not apply to the majority of cases, for despite the light in which he views extravasated fluids, gases, etc., solid substances constitute the largest contingent in the series of foreign bodies, and these phenomena of absorption and organization never occur in them. He was also in error when he advanced the following general proposition: "Foreign bodies incapable of organization are absorbed by the lymphatic system with a facility and promptness equal to the divisibility of the molecules of these bodies."

Delpech's first proposition does not only sin by excess, but also by omission, because it is impossible to classify all observed varieties in the category which he forms. Thus, where does he range the foreign bodies which are fixed to parts, like collars, rings, etc.? They are neither eliminated nor encysted, much less absorbed. They exercise an injurious mechanical action which is sometimes the source of serious accidents, and which have no relation to their elimination. On the other hand, cannot the economy tolerate foreign bodies without the formation of a cyst? or can we range in this category the cases of tolerance of the stomach, intestines, or bones, or the numerous examples of migrating bodies? This is, nevertheless, the opinion of the Montpellier surgeon when he says that: "Foreign bodies which are equally incapable of organization, absorption, or solution, or of exciting in the surrounding parts an inflammation which is capable of expelling them, may be tolerated by the latter under the following condition: the surrounding organs undergo, on account of their presence, an alteration which will result in the formation of a cyst capable of containing them." Is it not preferable to enlarge the advantages of this tolerance beyond these too restricted limits, and to admit it either with or without cyst formation in all the tissues, the parenchyma as well as the cellular tissue, the limbs and the visceral cavities? It is from this

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[1] Delpech: Traité des maladies chirurgicales, T. II.
[2] Lancet, 1876, T. VII., p. 776.

latter point of view that I look at the question, and I can formulate it in a simple manner by the following proposition:

Foreign bodies in the organism are either tolerated, or they give rise to secondary symptoms.

§ I.—THE TOLERANCE OF FOREIGN BODIES.

A body is tolerated when it does not manifest its presence by any apparent or latent symptom, or by any disorder in the harmony of the parts. Absolute indolence is a necessary condition, but it is not the only one. Thus, the foreign bodies of the œsophagus, which produce terrible disorders by ulcerating the walls of the great vessels, have very frequently not attracted the attention either of the physician or patient.

If we pass from general to special considerations, we will soon find that the tolerance is exercised in three different forms:

1. Tolerance of foreign bodies in the natural channels.
2. Tolerance of migrating bodies.
3. Tolerance of encysted bodies.

These three varieties are very distinct, and it is impossible to compare the manner in which a cherry-pit remains innocuous in the intestine with the process which guards the tissues in their contact with wandering needles or bullets. I shall review each variety separately.

1. Tolerance of Foreign Bodies in the Natural Channels.

In order that a foreign body which is accidentally placed in the natural channels be tolerated, it must fulfil a certain number of conditions dependent upon it and upon the canal which it occupies. It must never obstruct the lumen to the point of proving an obstacle to the course of the secretions, excretions, or fluids which traverse it—a condition which is very difficult to realize if we reflect upon the small size of certain canals, and the intolerance of others. Furthermore, the walls must not be irritated from the contact; in a word, the body must not manifest its presence in any manner. What are the passages in the economy which can realize these conditions? There are very few, though authenticated examples have been observed. In the first place, the body may be hollow or tubular, so that it permits the free escape of fluids or gases. This fact is not extremely rare, and has been observed more than once in the bronchi, urethra, and even in the digestive canal; but the other condition, *i. e.*, the integrity of the part upon contact, is almost impossible to realize. Nevertheless, pieces of bone have been found in the lung upon autopsy, which had produced no symptoms during life, and had left no alterations as traces of a stay of several years in the organ. But it is in the intestines that we could reasonably expect to find cases of tolerance, because the mucous membrane of the digestive tract readily tolerates the contact of foreign bodies, and because the dimensions of the canal predispose less to obstruction, especially in the greatly dilated portions like the stomach and colon.

Moreover, this tolerance is much greater than we really believe and than authors state. It is not exercised alone upon bodies which remain for a long time in some part of the canal, but also upon those which, being carried along by its contents and the contractions of its walls, pass

through seven or eight metres of the intestines without any detriment to the economy. It is not necessary to regard these examples of tolerance under the same head as those in which the object, after having traversed half the body without any accident, attracts attention by appearing upon the sole of the foot. The tolerance of mucous membranes really exists, therefore, whether the foreign body is movable or confined to a district which it does not leave. It is true, however, that the latter variety has furnished the most astonishing examples; upon numerous occasions, physicians have been greatly surprised at finding in the stomach of a lunatic, or other person, knives, forks, stones, and fragments of all kinds, the presence of which had been unknown. If pains are taken to examine the vermiform appendix in all cases, we do not doubt that a large number of examples would be found in which nuts, seeds, etc., are lodged in its interior. Absolute indolence in such cases is not a rare event, and a six livres piece has been found in one case, and a shoe-buckle in another, which had not been voided for more than twenty-five years after ingestion.

Tolerance of Migratory Bodies.

Foreign bodies which traverse a certain distance in the tissues without producing any symptoms, and which have therefore been termed migratory, arise from two different sources ; some, introduced through the natural passages, only enter the tissues after having perforated the walls of the canal from within outward; the others belong to the groups of foreign bodies from "effraction," and have perforated the skin.

They include especially pins and needles, or similar bodies which are pointed at one end, and which may also progress without irritating the parts and even without wounding them : the spikes of grasses, and granules of lead may also act in the same manner. It is more difficult to explain the presence of large bodies, such as a piece of spoon, under the skin ; in a case of this kind, reported by an author, migration could alone account for its presence in the scapular region. A few general laws govern all these cases, such as the following :

a. *All migratory foreign bodies travel along the thickness of the tissues, and especially in the cellular tissue without being surrounded by a protecting envelope.*

b. *The direction in which they advance is not always indeterminable, and they have a manifest tendency to obey the action of gravity, and also to approach the skin.*

c. *Their harmlessness is so much the greater, the more deeply they are situated.*

These propositions require further explanation. When migratory foreign bodies are found lost in the tissues upon autopsy, they are very rarely enclosed in an envelope, at least if they are not superficial. In all cases it is impossible to follow the track of the path which they had pursued through the tissues. Not alone that the patient possessed no knowledge of it, but even perforation of organs as sensitive as the intestines has given rise to no symptoms. Nevertheless, in some cases the number of the foreign bodies was so great that the body was literally covered with cicatrices caused by their extraction. Villar's[1] patient had "upon the

[1] Dict. en 60 vol., T. VII., p. 66.

inner aspect of the hand, arm, axilla, the lower surface of the left breast, the abdomen, and as far as the knee of the same side," an appearance like stars, from an innumerable mass of cicatrices formed by the bistoury in removing the objects which appeared under the skin. The cases reported by Silvy, Peter, and Otto of Copenhagen, are no less surprising; migratory needles have been known to arrive at the surface by thousands. It is true that their tolerance has not always been absolute, and even death has been known to occur in consequence of perforation of the vessels or of other organs too irritable to permit their passage. These facts, though known for a long time, have not been admitted by all authors, and Peter had thrown doubt upon the authenticity of some of them, justly pointing out the frequency of hysteria in the individuals who presented the needles ; and the possibility of deceit is so much the more admissible as anæsthesia is not a rare symptom of this affection. He believed that the patients successively introduced all the needles under the skin in order to make believe that they had swallowed them. More recently Alban Doran, physician to Saint Bartholomew's Hospital in London, has reopened the question, and he admits that these cases are not all authentic, and that their benign nature, which is looked upon as usual, is not so frequent as we may think. He derives his opinion from a very large number of cases; nevertheless some well authenticated facts enable us to affirm that this tolerance for foreign bodies does really exist.

The force which propels these bodies to the skin is very imperfectly known, and it is to be remarked that they very rarely ascend along the limbs or trunk. Nevertheless, Bayen[1] has reported a case which is not unique, observed in a man who had introduced a needle in the knee, and who, after a certain lapse of time, felt a pain in the shoulder of the same side, and in the skin of the chest above the breast. The foreign body, which did not measure less than two inches in length, was extracted from this situation by an incision. Much more frequently the bodies which are swallowed, or otherwise introduced, descend in the lower parts of the trunk to the groins, and even to the feet. Those which pass through the œsophagus to the neck follow the organs of this region, and pass by preference toward the arms or axilla. But the tendency to migration is less marked when the body, starting from without, has not penetrated deeply; very frequently, also, needles which have been plunged into the groin make their exit at a little distance from their point of penetration, and cases analogous to that reported by Kerandren[2] are exceptional.

Finally, the immunity which migratory bodies enjoy diminishes as they approach the surface. In the simplest cases they do not manifest their presence, except by pain upon pressure; but much more frequently they give rise to a small subcutaneous abscess, which favors their elimination.

3. Cyst-Formation.

I have stated that a certain number of offending bodies may be tolerated without becoming encysted, especially those which belong to the preceding category. But others remain equally inoffensive, thanks to a peculiar pathological process, which develops around them and which terminates in the formation of a cystic sac. This process includes three dis-

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[1] Canstatt's Jahresb., 1867, T. II., p. 517.
[2] Breschet : Art. Corps Étrangers, Dict. en., 30.

tinct periods: 1st, a period of isolation; 2d, a period of plastic secretion; 3d, a period of organization of the cyst.

In their writings upon this question of general pathology, authors have confined themselves to determining the fact without endeavoring to explain it, and they have not appreciated the importance and necessity of the isolation of the foreign body. This is, nevertheless, the chief element in the question, because cyst-formation is impossible if the wound communicates with the air, if it suppurates, and if the deeper part of its course is not absolutely isolated. It is very easy then to comprehend the ready predisposition toward encystment of sharp foreign bodies, which present no wound, so to speak, and are isolated. When these conditions are not realized from the beginning, nature must perform this preliminary work; this may require a very long time, and does not always succeed. If the isolation occurs in the first few days, it is generally in consequence of the union of a part of the track by first intention. And this applies not only to simple wounds, produced by piercing or cutting instruments, but also to contused wounds, at the bottom of which projectiles, bullets, etc., are lodged.

After the isolation obtained by the primary or secondary reunion of a portion of the track, the secretion of plastic lymph produces around the body an eminently organizable fluid atmosphere, which infiltrates and even penetrates its pores. It is this fluid which, by undergoing various transformations from the periphery to the centre, forms the cystic pouch. While this process is going on around the body, the adjacent tissues do not remain entirely unaffected, and a more or less extensive zone of congestion in the tissues attests the part which they take in the production of the cyst. Either organization is arrested when the peripheral fibrous envelope isolates the body and guarantees the tissues from the irritation which its contact determines, or, on the contrary, the process continues until the body is solidly imbedded in a fibrous capsule, which shuts it up from all parts and even penetrates it. Of these two varieties of cysts the first alone merits the name, because in it we find a pouch and a fluid, while the expression encapsulation is better suited for the second.

Hitherto I have not considered the nature of the foreign body and the peculiar conditions which the wound presents, according to its depth, its origin, and the tissues which it involves. All these questions are nevertheless very important, as we shall see, and relate to two principal factors, the foreign body and the wound.

The shape of the wounding body is not an indifferent matter in the production of the cysts, and it may be said that the latter present less chances for development the more irregular the object is. There are several reasons for this difference; in the first place, an irregular body rarely makes a regular wound, and as I have already shown, this condition, if it is not absolutely indispensable, plays a very important part; on the other hand, irregularities irritate the tissues and are opposed to the organization of effused lymph. There are two shapes which are more favorable than others for encystment, viz., the round and oblong; but this is not a universal rule, for pointed, and even very irregular bodies, are sometimes encysted. Nevertheless, the majority of cases have been observed in beads of lead, bullets, wires, elongated pieces of steel, glass, etc.

It is hardly necessary to say that the smaller the body, the greater the chance of being tolerated in the midst of the tissues; in fact, they must not exercise upon their surroundings a mechanical compression which is not suited to facilitate the secretion and organization of lymph. In addition

to the two preceding conditions, viz., regularity and smallness, there are other less important ones, such as the consistence and nature of the body.

These qualities are dependent upon one another to a certain extent, because organized bodies do not always have a great consistence, and are less tolerated than those which belong to the mineral kingdom. All other things being equal, the harder a body is, the greater are its chances of becoming encysted. This proposition explains the fact that the examples of encystment of organic matters—fragments of bone and clothing—are so rare, compared with those of hard bodies like metals, stone, glass, etc. The nature of the body exercises a very great influence, as surgeons had observed from the earliest times. In fact, experience teaches that the tolerance increases as the offending body is more inert and less assailable by the fluids of the organism.

Numerous facts also demonstrate the existence of an increasing tendency, as we pass from wood to earth, from earth to sandstone, from sandstone to porcelain and glass, and from the latter to the metals, which possess the happy privilege of being more harmless than all the other substances. There are even palpable differences among metals, and lead, gold and silver are, in the order of their enumeration, least injurious to the organism.

I can now only glance at these questions, which will find a more suitable place in special chapters, and I can sum up all the facts referring to the offending body by stating that it will present so much greater chances of becoming encysted, the more regular, small, hard, and metallic it is.

If, however, we attempt to study the influence exerted by the wound, we cannot fail to perceive that it is not to be numbered among the least. In the first place, depth is an almost indispensable condition in order to procure isolation. This fact was known to John Hunter, and he recognized its importance perfectly when he wrote that bodies are tolerated better, the more deeply they are situated. This Hunterian "law of depth" is verified by an extremely large number of facts, and I think that this favorable circumstance is explained by the more favorable conditions for isolation when the track of the wound is long, than when it is short. The fact is very useful, and finds verification in slight as well as in contused wounds.

But it is evidently necessary to pay a large share of attention to the nature of the wounded tissue, and the variable conditions in the vitality of the parts traversed by the projectile, for Hunter's law only applies in reality to the limbs and deep cellular tissue. It ceases to be exact when the offending body is situated in the centre of a parenchyma, and involves serous membranes or irritable organs of a very delicate structure. Nevertheless, this increased susceptibility does not exclude cyst-formation, and, at the present time, examples of foreign bodies encysted in the brain, heart, lungs, liver, and even the serous membranes, are not very rare. Their manner of production is not modified, and the three periods remain the same; the tolerance, however, is more difficult to obtain, and especially to maintain.

Whatever the nature of the wounded tissue, the condition of the canal has a very important influence upon the production of the cyst. The object will have so much greater chances of being tolerated, the smaller, narrower, and less contused the wound is. This tendency, consequently, increases or diminishes according as the wound is produced by a piercing, cutting, or contusing instrument. Missiles of war, which contuse the parts and leave in their track a cylinder of sloughing tissues, are poorly

suited to favor tolerance. It is true that this alteration of the tissues diminishes in proportion as the body buries itself in the economy and loses its force, so that, at the moment in which it is arrested, the contusion of the adjacent parts becomes almost nil. The blood which is extravasated into the canal not alone diminishes the chances of immediate reunion, but also counteracts isolation and cyst-formation. When the inflammation is propagated to the portion of the canal which contains the foreign body, it dispels all chances of encystment. Nevertheless, surgeons know that even bodies which are poorly tolerated by the organism, as portions of clothing, bits of wadding, etc., have been retained in a wound which has suppurated and cicatrized. But we must not mistake this provisional tolerance for true cyst-formation, for this continuance in the midst of the cicatricial tissues of the canal is only temporary, and, at the end of a little while, the cicatrix reopens, suppuration reappears, and fistulæ are established and continue to secrete until the foreign body has been eliminated. This pseudo-cyst-formation has been specially observed after gunshot wounds.

In concluding this chapter upon the tolerance of foreign bodies in general, I will add that it is not always indefinite, but that, after a lapse of ten, twenty, thirty years, etc., it may cease and give place to the most severe symptoms, which are even capable of endangering life. Injuries, the condition of the constitution, old age, intercurrent diseases, and destitution are powerful causes, which have been able, upon more than one occasion, to reawaken the irritation and terminate the tolerance. In such cases the cyst suppurates and an abscess forms which terminates in elimination, fistulæ, or in very severe complications when the body is in the neighborhood of an important organ (heart, aorta, serous membranes, etc.).

§ II.—VARIOUS SYMPTOMS.

It is very difficult to include in this general study all the symptoms which follow the introduction of foreign bodies in the organism, and the authors who have written upon the subject have placed very different interpretations upon it. Nevertheless, the majority adopt a very broad standpoint, regarding all the symptoms as useful or exaggerated manifestations of the natural tendency to elimination. I do not see any advantage in looking at the question in this light, and I believe it is better to look for the cause of the symptoms in the effects of the mere presence and mechanical action of the foreign body. In this manner a large number of symptoms of mechanical origin, such as obstruction of the canals, compression of the adjacent parts, and reflexes of all kinds, will be included in this chapter under the same heading as the inflammatory symptoms.

Changes undergone by the Foreign Bodies.

Before beginning the study of the symptoms produced by the presence or retention of foreign bodies, I will rapidly pass in review some of the changes which they undergo, and which are not unimportant with regard to the primary or secondary phenomena. These changes are due in part to the nature of the body, and to the surroundings in which it is placed. The two factors evidently exercise a synergic action because the environment does not act upon the body, except insomuch as the lat-

ter gives way, but there are numerous cases in which the influence of one is predominant. I will here mention an example: all foreign bodies in the bladder, after they have remained in the organ for a certain length of time, become the centre of calcareous or phosphatic concretions. In these cases this important modification is caused by the influence of the surroundings. On the other hand, we may refer to the case in which a bean has lodged for a longer or shorter period in the bronchi and begins to germinate. The conditions are evidently changed, and the foreign body has now become the point of departure of the changes. Imbibition is the simplest of these changes, and it presents itself with the greatest intensity when the bodies which are introduced are dry and spongy. Every one knows the use to which surgeons daily put prepared sponge. It has happened that this substance has been swallowed, and that the imbibition, by increasing its volume, renders its presence less inoffensive. It is this increase of volume which may also become the point of departure for very severe symptoms. Whoever has filled the skull of a young individual with beans knows what force the swelling due to imbibition may produce; and science possesses numerous examples of the introduction of peas, beans, or other dry grains into narrow canals or orifices like the external auditory canal and the nasal fossæ. Not only does this result in a very great difficulty in extraction, but sometimes in very acute symptoms due to compression.

If the imbibition occurs in a substance capable of solution, it constitutes one of the most fortunate contingencies. Thus, sugar, large pills, gum arabic, licorice, etc., have been, upon more than one occasion, the cause of disturbances which disappeared little by little as they were dissolved by the saliva and drink.

Imbibition is sometimes useful in another way by disintegrating the body and thus reducing its volume and consistence. The discharge of cotyledons separated from beans which have remained in the bronchi is explained in the same manner.

Solution by the slow action of the fluids is a much rarer event, is extremely slow, and is not, like the preceding, the result of a physical, but of a chemical action. I do not refer to the solution of bodies of animal origin, in the gastric juice for example, but to the corrosive action which these fluids in the economy may exercise upon hard bodies like metals. For a long time surgeons have noticed that pins, needles, and metallic plates, which they extracted from the body by incision, did not preserve their ordinary aspect; and more than once they were found rusted, oxidized upon the surface until they were blunted, sometimes broken, and surrounded with a brown or black pulp. This is not true of lead bullets, which only undergo a slight change of their surface, becoming covered with lead salts, very probably sulphates. This slow action is exercised under even more favorable conditions when the foreign bodies are situated in certain canals, and especially in the digestive tract, in which they are so frequently found. Recently, Vincenzo[1] and other foreign surgeons have advanced opposite opinions, some maintaining that the digestive fluids materially affect the surface of metals, and others denying this action.

The literature is full of facts which show that changes occur in needles, coins, knives, and forks. This action must be very effectual in order to dissolve the middle portion of a fork, and thus diminish the chances of

[1]Annali universali di medicina, 1869.

the death of the patient. However, there are cases of corroded knives, etc., and ferruginous salts which testify to this slow erosion. The older writers did not doubt this solution, and as their knowledge was not very advanced, they dreaded a possible poisoning more than inflammatory symptoms or perforation. Are all metals assailable? It is difficult to answer this question, despite the opinion entertained by all that silver, gold and platinum are unassailable. Thus, a hollow silver pessary was finally perforated in consequence of its prolonged stay in the vagina, and granulations had penetrated it through this erosion. Nevertheless, the action of the organic fluids upon the nobler metals is usually very weak, and upon glass, stone, marble, etc., it is nil.

I will merely say a few words upon germination, which is a curiosity rather than a normal phenomenon. Caron quotes the observation of the sprouting of cherry-pits after prolonged continuance in the cæcum.[1] At other times, beans have been known to sprout during their retention in a bronchus; in rare cases, similar phenomena have been observed in the bladder. The incrustation of foreign bodies which have remained for a long time in glandular canals or ducts, especially in those which are the seat of excretions or secretions, is more general. According to the large majority of surgeons, the local inflammation favors the change in the secretion, and predisposes to calcareous deposits. I must admit that I cannot satisfy myself with this explanation, and I do not believe that the intervention of any inflammatory process whatsoever is necessary. If these symptoms coexist, it is equally proper to attribute them to the irritating action of the concretions. I am also inclined to attribute all these incrustations to a much more general phenomenon of reflex origin. All bodies placed in a glandular canal produce, by their mere presence, from reflex action and not from the spread of inflammation, a change in the secretion which will result in the production of concentric layers of calcareous deposit. I restrict myself, for the present, to this bare statement, as I propose to return to this subject in studying the reflex disorders produced by foreign bodies. In the bladder, in which incrustation is most frequent, it terminates in the formation of nucleated calculi, which constitute a very curious class, and which I shall study with great attention. We also find concretions in the urethra, Wharton's and Steno's ducts, and in the intestines, in which they are termed bezoars or enteroliths, and may acquire a considerable volume (Sanchez de Toca).

Finally, foreign bodies may adhere to one another, and form true conglomerates, which also become very dangerous; such cases have been especially observed with reference to the intestinal tract. Thus, cherry-pits, the seeds of raisins and oranges, strawberry and mustard seeds, may be the origin of these strange tumors. In some cases, on account of the large number and the character of the foreign bodies, they become united into masses, which approach in structure the bodies known to veterinary surgeons as wool-balls. In a specimen presented to the Royal Society of Berlin, in 1777, a mass of hairs was found in the stomach. A German journal contains several analogous facts, and among others the following:

Observation.—Max Huppert had the opportunity of making an autopsy upon a lunatic who died of tuberculosis, and who, during the last few months of his life, swallowed all sorts of small articles, some of which were passed in the fæces. The mucous membrane of the œsophagus, especially upon the posterior wall, was slightly injected and covered with a thin layer of whitish mucus. The dilated stomach contained about 200

[1] Bull. de la Soc. Anatomique, 1855, T. XXX.

grammes weight of objects, consisting of curved needles, chair-nails, pieces of spoons, iron nails rusted black, a piece of a knitting-needle eight centimetres long, black and rusted, two keys about five centimetres long, covered with rust and almost exfoliated, pieces of glass, stone, and beads. Furthermore, there was a mass of tangled hairs which did not resemble the patient's hair in color. This ball of hair was largely mixed with needles and other objects, and even during the lifetime of the patient had passed to the anterior wall of the abdomen. The mucous membrane of the stomach was of a slaty black, thickened several millimetres near the cardia, and formed elevations of a brownish black color upon the fundus of the stomach. Toward the middle, at the point at which the ball of hair was situated, the mucous membrane was equally thickened and grayish, and from thence to the pylorus it was strewn with spongy granulations or polypi with a large, brown base, and a slaty, rounded summit. The remainder of the mucous membranes was of an ashen gray color, thickened from 1–2 millimetres, and thinned in spots, but not ulcerated. The submucous tissue was very much thickened. The muscular coat was equally hypertrophied, especially at the pylorus. (Archiv für Heilkunde, T. VI., p. 302, 1865, and Schmidt's Jahrbücher, 1867, T. CXXXV., p. 74.)

The intestines have more than once formed the site of similar masses, either formed of swallowed hair, or of tow, various barks (cacao), or the wood of chewed sweet-root. The history of all these curiosities belongs to the chapter on foreign bodies in the digestive tract.

Symptoms due to the Presence of Foreign Bodies.

I have stated above that every foreign body acts by its mere presence, or by its mechanical action, in compressing and wounding the surrounding parts. The symptoms produced by its presence are:

1. Reflex disorders.
2. Functional disorders.
3. Symptoms of obstructions.
4. Irritation and inflammatory phenomena.

Each of these groups admits of certain developments which it is impossible to give in such a general article as this. I will therefore restrict myself to certain summary indications which will find their confirmation in special chapters. Before beginning the separate study of each group, I will add that they are not all found represented in each particular case, and that one or the other always predominates.

1. Reflex Disorders.

Almost all the primary symptoms, produced by the presence of foreign bodies in the organism belong to this category. They do not, by any means, present the same intensity—and this is not alone true of different organs, but also of the same part of the body. Thus, while they are very slight in cases of wounds, they become more severe as the foreign bodies occupy important canals, and attain their maximum severity in the air-passages.

These reflex symptoms are of two different kinds: some are acute, suddenly attaining their maximum intensity and constituting in their totality a sort of initial paroxysm; others, on the contrary, appear more slowly, but are much more persistent, develop in a latent manner, remain for a long time, and give rise to grave disorders by their continuance.

Among all the primary symptoms pain is evidently the most common; it is hardly ever absent, and changes its character in passing from one re-

gion to another. At one time it constitutes the most serious symptom (cornea, conjunctiva), it may increase with every movement (bullets, etc.); furthermore, it is acute or piercing, heavy or dull, and is sometimes so intense that it gives rise to syncope and forces the patient to cry out.

The reflex disorders of mobility are very interesting and account for the severe symptoms which follow close on the introduction of the bodies, especially of those which occupy the natural canals. In fact, a spasm is always produced in the muscles which belong to the reflex zone of the region occupied by the foreign body. It is this spasm which causes the marked suffocation in the case of bodies arrested in the œsophagus; this is sometimes sufficiently intense to cause death in a very short time. In these cases the glottis and expiratory muscles are contracted, and prevent, to a greater or less extent, the free entrance of air into the lungs. The same phenomenon is produced, though with some modifications, when the body has entered the air-passages. In the second case, the occlusion of the glottis is not so perfect, and there are alternations of irregular expiration due to intermittent muscular contractions; furthermore, the expiratory muscles act with great vigor. It is to this important reflex that we must look for the cause of the initial paroxysm in foreign bodies of the œsophagus and air-passages, a paroxysm which is characterized by suffocation, dyspnœa, irregular cough, cyanosis of the face, anxiety, and all the symptoms of a most serious condition.

How do the stomach, intestines, bladder, urethra, etc., act when a foreign body has entered their cavities? They contract with an amount of force which becomes greater the less the substance conforms to the nature of their functions. Hence the vomiting, incontinence of urine, and, in the rectum, the straining and tenesmus which the spasmodic contraction of the sphincter renders ineffective. This action is less severe in the glandular ducts, but it is nevertheless present even in them.

The *vis medicatrix naturæ* which serves by these means to produce spontaneous expulsion has been very much wondered at. But, though it is useful in some instances, in a large number of others its action produces serious symptoms. However this may be, the acute reflex disorders at the onset do not last long with the same intensity; they usually subside in order to give place to a period of calm, and may reappear and then diminish very gradually.

In addition to these acute reflexes, I have stated that there are others which develop very slowly and which result in alterations or modifications of the nature of the secretion. There is either an increase in the quantity, as occurs with regard to the saliva when a foreign body is arrested in the œsophagus; at other times, on the contrary, there is a change of composition, which is shown by an early alteration and exaggerated production of certain elements; all the secretory or excretory canals belong to this category. Everything leads me to believe that the nervous system of organic life plays an important part in the phenomenon which terminates in the latter cases, in the formation of stratified calculi, the nuclei of which are constituted by the foreign bodies. But the effect of this reflex is not always so evident, and there are organs which never take part in the formation of these concretions; among others, the stomach belongs to this class. However, an analysis of the facts proves that this change exists, but is very peculiar in foreign bodies of the stomach and intestines. It results in a modification of the nature of the digestive fluids and in a consequent diminution of the secretions which nourish the body.

Hence the rapid and persistent marasmus which has been observed in a large number of cases, and which is so difficult to combat.

2. Functional Disorders.

The preceding remarks naturally introduce the study of the functional disorders, upon which I will not insist on account of their frequency. It is very rare, in fact, that an organ or tissue is the seat of a foreign body without a notable disturbance of its functions. The limb which is the seat of a bullet or fragment of a shell almost always becomes powerless; every movement produces and exacerbates the pains; deglutition is very difficult when a body is arrested in the œsophagus, and respiration is so much interfered with by the presence of a foreign body in the air-passage that asphyxia may develop in a short time. The individual who has a foreign body in the urethra can only micturate in drops, and evacuation of the bowels is impossible when the rectum is thus obstructed. To all these local disorders we must also add the deterioration of the general condition, which is expressed very promptly by loss of appetite, malaise, emaciation, and even in some cases by convulsive nervous disorders. However, all these symptoms are not so serious as the following:

3. Phenomena of Obstruction.

The disorders hitherto enumerated do not refer to foreign bodies by effraction, and this is also true with regard to this third group, which only refers to the channels of the body. There is nothing which is more readily understood than the obstruction to the circulation of fluid or semi-fluid matters produced by the presence of a foreign body. They diminish the lumen of a canal so much the more, the narrower the latter is or the larger the body. Obstruction is thus merely a relative question, and a body which, in one canal, would produce an entire arrest of its contents, would be perfectly harmless in others. Furthermore, the different portions of the same canal vary in this respect, and a large number of bodies which obstruct the œsophagus may pass through all other parts of the intestinal tract without accident.

Very frequently the presence of a body only causes a hinderance to the passage of fluids, whether it is the air as in the air-passages, the food in the digestive canal, or the products of secretion in the glands. For example, a ramification of the bronchial tube may be obstructed, and the absence of a vesicular murmur in its distribution indicates the obstruction to the respiration; in the same manner, with regard to the œsophagus, it often happens that only the fluids can pass into the stomach. Is there any necessity for the statement that a similar obstruction also exists in other cavities, like the vagina, external auditory canal, nasal fossæ, etc.?

But complete obstruction, whether primary or secondary, is not a very rare event, either in small glandular openings or in large canals. When it is produced primarily it begins suddenly, and is characterized by symptoms which are so much more severe as the obstruction intercepts the passage in the canals most necessary to life. Thus, examples of sudden death from foreign bodies in the vestibule of the larynx are not extremely infrequent, and this accident occurs generally in old people who are unable to masticate, and in whom the epiglottis does not functionate

properly. In such cases the effect is startling, and the asphyxia kills suddenly, as if the patient were stricken by apoplexy. Of all the canals in the body this is the only one whose obstruction causes such rapid symptoms; of course I except the vascular channels, which do not enter into this category. The obstruction produces symptoms earlier the closer the body is situated to the origin of the canal. It will act more rapidly in the ureter than in the urethra, in the œsophagus than in the colon, and near a gland than at the end of its excretory duct.

After the obstruction has developed, the phenomena, which occur below the point involved, vary according as the canal has one or two openings. The digestive tract and certain canals, like the lachrymal canal, belong to the latter class; the large and small glands are ranged in the first. In the canals with two orifices, dilatation at first occurs above the obstructed point, together with an accumulation of material. Then, after a variable length of time, the alimentary or secreted substances find no outlet, and flow back or regurgitate toward the orifice of entry; the tears flow down the cheeks from the lachrymal canal; and stercoraceous vomiting appears when, for example, the obstruction is situated in a portion of the intestine.

On the contrary, obstruction in the glands produces an accumulation of secreted or excreted material—a dilatation beyond the obstacle—and finally disorders in the secretory organ itself. There is not even a canal so small as Wharton's duct, which does not present all these phenomena. Fever, and even resorption of the fluids, occur if the obstacle is not removed; this fact, which is so well known with regard to biliary calculi, is equally true of all foreign bodies in glands.

How does this series of phenomena terminate? Either the obstacle is spontaneously removed, and the accumulation which existed at the level of the foreign body disappears; or the organ, being too strongly dilated, sloughs and its contents are extravasated into the neighboring tissues; the intestines, bladder and urethra sometimes present this termination, which is a very grave one when the organ is surrounded by a serous membrane. The inflammation may also invade the duct and organ, giving rise to abscesses and severe phlegmons, which may be propagated to adjacent parts, and even to the glands, if the affection involves one of these organs. But death may occur before the appearance of these complications, when a persistent obstruction compromises an important function. In the same way that the existence of a foreign body in the air-passages produces asphyxia, it has also been found that patients may die of inanition from the arrest of substances in the œsophagus.

4. Irritation and Inflammatory Symptoms.

The irritation caused by the presence of a foreign body in the organism is not the same in all cases, and varies almost indefinitely according to the conditions under which the penetrating body is placed. Furthermore, all the tissues do not act in the same manner when brought in contact with a foreign body. In speaking of tolerance, I have previously had occasion to state that a very large number of facts demonstrated an almost absolute indolence of certain organs; the same reasons that I then adduced in order to account for this immunity will serve to explain the differences in the irritation produced. The more an organ is habituated to contact with bodies derived from the external world, the less actively

will it react. This exception refers almost exclusively to the digestive tract, because it alone is ordinarily in contact with semi-solid bodies (the alimentary bolus, fæcal matters, and substances which are unaffected by the digestive fluids).

The tissues and the other natural channels, on the contrary, always manifest irritability, but it varies according to the different organs. While it is very great in the respiratory passages, the tissues of the viscera (brain, heart), the articulations and serous membranes, it is less acute in the secretory or excretory glandular canals, the muscular tissue, etc. Another consideration also intervenes here, viz.: the mobility of the body, which is much less dangerous in those organs in which the object is found floating free, than in those in which it is directly in contact with the parts. Thus, all other things being equal, bodies which are lodged in the stomach and bladder produce irritation less frequently and severely than those which are in direct contact with the walls of the organ, or with the surrounding tissues.

On the other hand, the body itself possesses no less influence, and all its physical or other properties which are unfavorable to its tolerance, predispose the organ to inflammatory symptoms.

An irregular, angular, pointed body, will produce a much more acute and intense inflammation than a smooth and regular object. In the same manner also, the character of the body plays a very important part because the tissues tolerate organic matters, wood, leather, cloth, etc., less than inert and mineral bodies, like the metals, stone, glass, etc. This fact is especially noticeable in the case of foreign bodies from "effraction," because the contact is then much more intimate than in the canals.

These preliminary considerations were indispensable before entering upon the study of the inflammatory symptoms, which occur in two very distinct forms—an acute, and a subacute or chronic.

Acute Inflamatory Symptoms.

These symptoms vary according as we consider them in the natural channels, or in wounds. In the mucous canals, the irritation produces an inflammation of the mucous membrane at the point where the body is lodged, and gives rise to redness, swelling, pain, and marked aggravation of the functional disorders.

The symptoms by which it is announced to the physician vary according to the organ affected, and we thus meet with œsophagitis, gastritis, tracheitis, cystitis, etc. This first period of infiltration of the walls is followed by suppuration of the mucous membrane, which ulcerates and mingles its products with the other secreted or excreted matters. Cystitis thus becomes purulent, enteritis is replaced by a purulent diarrhœa, and substances in the vagina produce vaginitis, etc. But the inflammation is not always limited to the surface, and not infrequently we find it invading all the layers of the organ and even the peripheral cellular tissue. Hence the more severe phlegmons around the canals—phlegmons which pass into suppuration, detach the tissues, and tend to fuse together. The œsophagus, urethra, and, in a general way, all the smaller canals which are in intimate and persistent contact with the foreign body, react in this manner. If the canal is not situated too deeply, the pus thus formed may be directed toward the skin, which it detaches and ulcerates; but it very frequently opens into the cavity of the organ and

alters its secretions. If the body is situated in an organ which is near a serous membrane, the latter will become involved in the inflammation, and the gravity of the affection is very much increased by this event. It may even result in death.

It is somewhat different in complicated wounds which have enclosed the foreign bodies, because the inflammation then develops more rapidly and pursues a different course, according to the organ involved. In the cellular tissue, and, in general, in the limbs, the reaction occurs immediately and is shown by an exaggeration of the pain, of the diffuse œdematous swelling, and of the redness and heat. The general condition itself is affected, and fever, anorexia, and gastric distress are present; the movements of the part are very much embarrassed. Exudation of plastic lymph soon occurs, discharges externally, and little by little is transformed into pus. How far does this peripheral inflammation extend? The answer is very difficult, because the greatest varieties exist. At one time it is limited to within a few millimetres of the track of the wound; at another, on the contrary, it spreads to a great extent and threatens a limb throughout its entire thickness. In the first case, all the pus escapes from the wound; in the second, it has a tendency to spread into the cellular interstices and to form secondary foci, which either open into the principal track or extend to the periphery of the limb and break through the skin. This pus is frankly phlegmonous, while the former variety, which passes through the track of the wound, is reddish in the beginning.

If we pass from the cellular tissue to other organs, we will find some variations in the ensemble of the symptoms. And first, mere inflammation of an organ like the brain or heart constitutes an extremely serious affection, if it is not limited to the cul-de-sac which contains the offending body. If it extends farther, life is endangered, and it is for this reason that examples of recovery from wounds of these organs are so rare when they are complicated by the presence of foreign bodies. In vain have the exceptions been accumulated for centuries; the examples of tolerance on the part of the brain and heart are, whatever may be said of them, veritable curiosities. Perhaps it may be necessary to make an exception in favor of metallic bodies, which are less dangerous, and to recognize a certain immunity in idiots and the insane, who have succeeded in plunging the most peculiar articles into the heart or brain without danger. The following history is opposed to everything that practice teaches us, but it is merely an exception, upon which it would be well not to rely as a basis of action.

Observations.—"Carpenter reports the case of a lunatic who, having succeeded in making a hole in the skull, behind the ear, with a shoemaker's awl, made use of this opening in order to penetrate the brain with various pointed foreign bodies. He recovered completely from the severe symptoms which followed, and died several months later after a fresh attempt at suicide by taking morphine. At the autopsy the brain was found to contain a wisp of broom as large around as a No. 20 sound, and two inches long, a crochet-needle, another wisp measuring a little more than two inches in length, and a headless nail." (American Journal of Medical Sciences, April, 1876.)

The inflammation remains a little more localized in the lungs and liver, and suppuration may occur as in simple wounds; but it is very rarely found to limit itself so readily in the serous membranes and joints. The period in which an amputation was thought to be early admissible, whenever a foreign body was lodged in an articulation, is not far distant, and this view was based upon the gravity of the almost inevitable inflammation to which its presence gave rise.

En résumé, acute inflammation assumes two forms in wounds complicated by the presence of foreign bodies: it is either very circumscribed, and is then compatible with life; or it is diffuse, and plunges the patient into great dangers, as much through its own action as through the functional disturbances which it produces.

Subacute or Chronic Inflammatory Symptoms.

When the irritation is not very acute and the tissues become gradually habituated to the contact of the abnormal body, the inflammation progresses much more slowly and changes its nature. The mucous membrane in contact with the foreign body is alone the seat of a chronic inflammation, which is manifested by a more or less extensive superficial ulceration. The reader has seen that in Max Huppert's observation the gastric mucous membrane became the seat of slaty brown fungosities at those places in which the epithelium was missing. The same alteration is produced in the œsophagus, intestines, and rectum. I do not imply that the mucous membrane alone participates in the inflammatory process, but the inflammation remains in the condition of infiltration in the peripheral cellular tissue, and in some cases even gives rise to useful adhesions between the two layers of a serous membrane. Moreover, each organ acts somewhat *sui generis*, and in this respect the lung undergoes a very curious change under the influence of foreign bodies in the bronchi. In fact, the latter ulcerate and the parenchyma becomes inflamed, assuming the form of a cheesy pneumonia. I will find more than one occasion in the course of this work to recur to this pseudo-phthisis which leads to marasmus and death. The latter is merely the result of the chronic inflammation, as in chronic purulent cystitis, ulcerous enteritis, etc. If the cause persists, these changes keep on increasing, and undermine the health little by little until they produce a cachexia, well known as that to which the term *marasmus of foreign bodies* has long been given. Even after the cause disappears, the cicatrices may become the starting-point of other complications, the consideration of which will find a better place in the chapter on remote symptoms.

Does chronic inflammation occur in cases of wounds complicated with foreign bodies? Under what circumstances is it produced? I have stated above that the great irritation which these bodies produce in the tissues results in the development of an acute inflammation; but in some tissues it develops slowly, as in the bones, especially when it is not propagated to the medullary tissue. Furthermore, chronic inflammation is very frequently the mode of termination of the acute form, and, in all these cases, it results in the formation of fistulæ. The latter are maintained by the presence of the foreign body, and do not close as long as the latter is present. It may happen that the wound heals, but such recoveries are only temporary, and the symptoms are reproduced under the influence of the slightest irritation. The body is found at the bottom of these fistulas, and is either inclosed in a bone, a cloaca, or in a cavity lined with vegetations, which secrete either pus or lymph. The external opening assumes the appearance of a large, flabby, reddish vegetation, at the summit of which the fistulous track opens.

II. Symptoms Caused by the Mechanical Action of the Foreign Bodies.

In what does the mechanical action of the foreign bodies consist? In order to thoroughly understand the following explanations, we must bear in mind that the foreign bodies may be irregular, rough, pointed, large, and heavy, and that all these properties may not be without an unfavorable influence. In the preceding chapter I made no reference to size or form, and presupposed that all the bodies were regular. Nevertheless, it is necessary to determine the injurious effects which are due to these qualities, and these I call the symptoms due to mechanical action. However, all these symptoms are the result of compression exercised by the foreign bodies, whether it acts from within outward, or vice versa. All rings applied to the surface of the body act by concentric compression, while bodies situated in the interior of the organism produce, with few exceptions, excentric compression. I will examine, in succession, these two varieties, beginning with the symptoms due to excentric compression, which are the most frequent.

I. Symptoms due to Excentric Compression.

1. *In the natural channels.*—Among bodies which are arrested at some point in the course of a canal, some are rendered immovable on account of an abnormal condition of the canal, others on account of their irregularity or size. All foreign bodies in the intestinal tract, for example, belong to this category. With regard to those found in other canals a large number distend them and also act by compression. Foreign bodies introduced into the vagina, nasal fossæ, external auditory canal, etc., do not act in this manner. The size and irregularity are the most serious causes of the symptoms in these cases. But even if its size is less, and the body presents a certain regularity, there are natural peculiarities of the wall of the canal which will give rise to this excentric compression. I wish to call attention to the vigorous action of the muscular coats of all these canals. In the first case, the foreign body compresses the organ, while in the second variety the mucous membrane compresses it. This peculiarity is very marked in all the canals which, like the œsophagus, urethra, and vagina, do not preserve their calibre when they are empty, and whose walls are in apposition. The surgeon utilizes this peculiarity when he introduces rings in some of these organs, as, for instance, pessaries to sustain or replace the uterus.

Such are the two causes which produce mechanical compression by slightly different methods, but with identical effects. Both may act simultaneously, when the body is large or irregular, and the canal elastic or contractile. We will now investigate the disorders which result from them; they may be classified under three principal heads:

1. Compression of the wall and of an adjacent organ.
2. Primary perforations. Erosions.
3. Gangrenous ulcerations. Secondary perforations of the wall and of the adjacent organs.

1. *Compression of the wall and of an adjacent organ.*—Every canal endowed with a certain amount of elasticity will permit of distention by foreign bodies, although this may not result in serious disorders if the

dilatation is only temporary. But this is not so when the body is fixed, and when the elasticity of the canal is exceeded, or when the canal is almost inextensible; a few examples will better explain my meaning. A fæcal mass, formed in the intestines, distends this organ without producing any great obstruction, if it keeps on moving, while its continuance at one point may give rise to serious symptoms. On the contrary, a smaller body, taking into consideration the dimensions of the canal, may become engaged in the nasal fossæ, the auditory canal, etc., which are but slightly extensible, and they may prove hurtful more rapidly. Furthermore, this compression need not be exercised upon the entire periphery of the organ, and it very frequently occurs that it is much more localized; for example, upon both extremities of the large diameter of an object. Elongated bodies, and even those which are flattened and placed on edge, only compress the two opposite sides of the wall of a canal. When a pencil or an inflexible rod is contained in the bladder, the irritated organ contracts in order to expel the abnormal body, and the pressure is brought to bear upon two opposite points of the bladder; the same phenomenon occurs in the stomach. Coins which have lodged in the œsophagus, and are placed on edge, produce identical effects.

On the part of the wall, a condition of exaggerated tension will result, giving rise to pain, which is greater the less extensible the canal is. The history of foreign bodies in the external auditory canal furnishes striking examples, and the pain has been known to produce the most threatening nervous symptoms. If the canal is extensible, its dilatation may compress some neighboring organ, and thus produce disturbances in its vicinity. Bodies of any considerable size, lodged in the œsophagus, furnish good examples of this; they compress the trachea, and, on this account, produce severe suffocatory symptoms, which have more than once led to a wrong diagnosis of their position. Large bodies, lodged in the vagina, give rise in the same manner to functional disorders in the genito-urinary organs and rectum.

2. *Primary erosion and perforation.*—If the body is irregular, as so frequently happens, the compression of the mucous membrane produces wounds or erosions as numerous as the irregularities, and the points, burying themselves into these wounds, rivet the body, which thus becomes solidly embedded. Pieces of dental plates, irregular and pointed bones, etc., which are so frequent in the œsophagus, act in the same manner in fixing themselves into the wall. This phenomenon occurs in all canals, and presents nothing peculiar when the bodies are irregular. But the state of affairs is changed when the shape of the body is regular and pointed, as is true of needles, pins, fish-bones, spikes of all kinds, nails, points of a compass, hair-pins, etc. Whenever bodies of this character are placed in a musculo-membranous canal, whether situated transversely or obliquely, they may produce primary perforations. The mechanism is similar to the preceding, except that, the pressure being exercised upon the long diameter, and, consequently, upon both ends of the foreign body, one of them, and perhaps even both, are plunged into the wall, and pass through it. The direction in which the perforation occurs is sometimes determined by the form of the body, as in spikes and needles, the mode of movement in which is always the same.

What are the effects of these primary perforations? The answer varies, according to the nature of the tissues perforated, and of that of the body. Whenever an irregular body penetrates completely or incompletely into the cellular tissue, inflammation may result, and lead to

phlegmons in the vicinity. If the canal is in contact with a serous membrane or an important vessel, it may produce a wound of these organs, the consequences of which are extremely serious.

The primary perforations of the stomach, bladder, intestines, œsophagus, vagina, etc., have caused death on more than one occasion. In the same manner an ingested needle or fish-bone has been known to penetrate one of the large vascular trunks of the thorax, and to lead to fatal hemorrhage. But, if the body is regular and very pointed, like a needle, it may pass entirely into the surrounding tissues, where it is sometimes tolerated, though it usually produces serious inflammatory symptoms. I have previously stated that these perforating bodies of the mucous membranes, which almost always present a uniform type, furnish a marked contingent to the class of migratory foreign bodies.

3. *Gangrenous ulcerations or secondary perforations.*—Primary perforations are relatively rare compared to the secondary, because they require a certain number of conditions for their production which are rarely realized. All bodies, whatever their nature, may on the contrary give rise to slow or secondary perforations. The mechanism is not appreciably different from that of the primary perforations, but it pursues a much slower course. A coin arrested in the œsophagus is a type which may serve as an example ; pressure is produced at both ends of the transverse diameter of the coin placed on edge, and the pressure is stronger according as the piece is larger and the irritated œsophagus is more contracted. All the rest of the circumference of the canal is healthy, while upon these two points the excentric compression produces an eschar at the end of several days ; in fact, this is the result of gangrene from compression. Very superficial at first, it increases appreciably, and may not only involve the walls of the œsophagus, but also the adjacent tissues. It would appear that this large, ulcerated communication, which has no apparent tendency to recovery, and which allows extravasation of the contents of the canal into the cellular tissue, should very frequently give rise to the most serious symptoms. But this is rarer than we might believe, because, on account of the slow progress of the ulcerative process, a preservative process occurs in the surrounding parts which become infiltrated, thickened and indurated. This is especially well marked in foreign bodies of the intestines, which are found in the neighborhood of the peritoneum, and which insensibly produce adhesions between the layers of the serous membrane. How often have foreign bodies in the stomach, thanks to the protecting adhesions produced by the pressure of the foreign body, passed into the subcutaneous tissue and protruded under the skin ! Everything leads us to believe that tufts of grass which have been swallowed may pass through the œsophagus, and finally produce an abscess in the side of the thorax, by producing adhesions of the layers of the pleura.

But, in addition to these fortunate cases, the foreign body passes very frequently into the adjacent tissues through the gangrenous perforation, and may undergo various changes. It is sometimes lodged without producing any symptoms, and the wound of the perforation closes up ; then at a later period, this body, after a period of variable tolerance, irritates the tissues and produces a phlegmon which either opens externally or into the canal. This termination is not extremely rare in the history of intestinal foreign bodies. Or perhaps it has partially passed outside of the canal, an acute inflammation occurs in the cellular tissue, and an abscess forms which opens externally. Such a termination has been noticed in the iliac fossa ; little by little the abscess becomes fistulous, and, inas-

much as the body has not left the intestine, there is no issue of fæcal matters. Large enteroliths and foreign bodies of the vermiform appendix have been known to act in this manner. Finally, in a third variety, there is an outlet for the foreign body, the abscess communicating externally and with the interior of the canal.

It is not necessary to state that these events are formidable complications, which sometimes terminate happily, but very frequently endanger the life of the patient. Foreign bodies in the bladder, vagina, and digestive tract offer numerous illustrations. Certain varieties of these perforations deserve particular attention because they present unusual gravity. When a body is lodged in a canal which is in the neighborhood of important vessels, the gangrenous ulceration may involve the walls of such veins or arteries, and at a given time, when the eschar has become sufficiently deep, the blood makes its way through a small opening; hence result very grave hemorrhages, which are beyond the resources of art. And these are not merely rare curiosities, since more than thirty fatal cases are reported with regard to the œsophagus alone. It is true that this, more than any other of the natural passages, is placed under the conditions favorable for the production of this accident; nevertheless, it has also been observed in the intestine, at points which are in connection with the primary iliac artery.

In lieu of a vessel, another hollow organ is sometimes involved in the eschar, and the perforation places two adjacent organs in communication. This variety of symptoms includes a certain number of facts which are very curious, both *per se* and also with regard to the difficulties of diagnosis and the uncertainties of treatment. I will mention a few examples. A foreign body of the œsophagus has been known to lead to perforation of this canal into the trachea; this hap-hazard communication of these two canals has always been followed by the most serious consequences, the patients dying either from asphyxia or inanition. Furthermore, bodies lodged in the intestines may ulcerate into the bladder and pass into this organ, together with intestinal contents. Under these conditions, a vaginal pessary has passed into the rectum, vesico-vaginal ulcerations, etc., have been produced. All these accidents are the result of excentric compression, the curious effects of which have not sufficiently attracted the attention of authors. For further details I refer the reader to the special chapters, which contain some paragraphs upon the influence of this mechanical action.

2. *Mechanical and excentric action of foreign bodies from "effraction."*—We must not expect to see the compression produced by foreign bodies as clearly defined as in the preceding cases, because the effect of their presence, which produced the inflammation, dominates the entire scene, and prevents us from observing the baneful influence of each factor. Nevertheless, under some circumstances, this action has been well determined, when the functional disorders presented some unusual factor or the course of repair was abnormal. In order to account for the manner in which these penetrating bodies act, we must remember that they do not change their volume, and that there is no contractile organ around them, but that they are impelled by a force which, upon plunging them into the tissues, leaves them in the neighborhood of very sensitive organs, which they are at liberty to compress. The nerve-trunks, for example, tolerate the proximity of foreign bodies very poorly, and the symptoms which result are the consequences of mechanical action. More than once threatening nervous symptoms have been observed which necessitated se-

vere operations, and even the removal of a limb, and which were solely attributable to the compression of a nerve by a foreign body. At one time two double-headed bullets, encrusted in the humerus, have injured one of the nerves of the arm; again, it is a bit of lead in the neighborhood of the median, or a bullet which, by compression of the sciatic, produces extraordinary sensory and functional disorders. I will have occasion to cite numerous examples of this mechanical compression, not only of the nerve-trunks, but also of the vascular plexuses, the visceral organs like the brain, and the organs of special sense. None are more frequent than the disorders of vision, caused by a foreign body in the orbit, which compresses some nerve-filaments in this region. We must also refer to the frequency of tetanus in wounds complicated by the presence of foreign bodies, etc. But bodies which have entered from without may also act, from their mere weight, and thus give rise to a certain number of symptoms. Pieces of metal and lead projectiles act in this manner when they are lodged in thin organs like the bones of the face. On account of the compression which they exercise upon the mucous membranes and the bones which they cover, ulcerations and latent perforations are very often found to be produced through which the bodies pass in the direction of their weight, and thus, after a very long period has elapsed, arrive in the pharynx or pass through the velum palati into the mouth.

Bullets, and even pieces derived from the breeches of bursted guns, have been known to force their way to the outside by their own weight, without hardly attracting attention.

Concentric Compression by Foreign Bodies.

The history of the symptoms observed after the application of constricting foreign bodies to the surface of the economy is entirely the result of this concentric compression. In order to avoid repetitions, I will restrict myself to a recital of the series of phenomena which are produced when an isolated organ like the penis, a finger, or a foot, are subjected to an abnormal constriction. A disturbance of the return circulation is at first produced, resulting in a venous stasis in the parts situated below the obstruction. This stasis is soon followed by œdema and puffiness, which appears *pari passu* with the pains, the latter increasing constantly, and even becoming excruciating. If the obstruction continues to act, the vitality of the parts becomes compromised throughout their entire structure, or only in the skin if the existence of the central parts is secured by a special circulation, such as is found in the penis. Thus, in this organ, the gangrene invades the skin much more frequently than the cavernous bodies themselves.

This class of symptoms has also been observed with regard to the testicles which an individual had passed, together with the penis, through a ring. Cancer of the penis has also been known to occur in a man whose prepuce had, for a long time, been perforated by a padlock, the key of which was kept by his mistress. But these are exceptional cases compared to the preceding ones.

Is there any concentric compression of the mucous membranes? It is undoubtedly very rare, but has been observed in some cases in which hollow bodies had been introduced into the natural passages. Thus invagination of the rectum has been produced in the interior of glasses or bottles introduced into the rectum or vagina. This is evidently a serious com-

plication, which aggravates the prognosis of the affection. Furthermore, a coprostatic tumor has been found pierced in its centre so as to form a real ring, in the interior of which the mucous membrane of the ruptured rectum was invaginated and strangulated; the ready discharge of fæcal matter rendered the diagnosis of the affection extremely difficult. Apart from these few exceptions, concentric compression does not occur in foreign bodies of the natural passages.

CHAPTER VII.

TERMINATIONS.

When art does not intervene to moderate or prevent the symptoms produced by foreign bodies which are not tolerated, they undergo various changes which may all be referred to the three following types:

1. Spontaneous expulsion or elimination.
2. Chronic and remote symptoms.
3. Death.

Some details are necessary in order to show how these various terminations are produced, and through what successive phases the organism passes before terminating in any of them.

1. Spontaneous Expulsion or Elimination.

The word expulsion indicates, on the part of the organs in which the foreign bodies are found, an active action which pushes them outward; it only exists, therefore, in the natural channels. But, even in these canals, expulsion is not the only means by which nature frees the organism from bodies which it cannot tolerate. Thus we know that forks, knives, etc., have perforated the intestines and have passed out of the abdomen through abscesses of the iliac fossa or the umbilicus. To this variety we apply the term elimination, and I will add that it is not rare in wounds.

a. Spontaneous expulsion occurs in various ways, and we may say that each canal makes use of peculiar methods. Furthermore, all are not endowed with this expulsive power to the same degree, and there are some which are poorly suited to effect this object. Two elements combine to favor expulsion through the natural channels: on the one hand the canal itself, and on the other, the products or matters which circulate in its interior. Either the canal has a preponderating influence, or, on the contrary, it does not act, or may even oppose it; finally, both elements may aid one another. I will adduce some examples of the first variety in which the canal plays a preponderating part. Every one knows the violence which efforts at vomiting present, and with what energy the œsophagus and stomach react when a foreign body is arrested in the primæ viæ. The rectum, by its contractions, may also expel large objects without any assistance; the contracted bladder has also been known to expel elongated bodies which chance had placed in the axis of the ure-

thra. By the side of these energetic reflexes of the muscular organs, the capricious inertia of the urethral canal offers a strange contrast, and if a sound is placed in the urethra, it will escape spontaneously, if measures are not adopted to retain it. If a foreign body has gone astray in it, not only is there no tendency toward expulsion, but, on the contrary, the action of the fibres of the canal tend to drive it in still farther and to make it pass into the bladder. In this instance the canal plays no useful part in spontaneous expulsion. Fortunately these examples are very rare, but they include all the glandular organs, and the inextensible canals like the auditory canal, the nasal fossæ, etc. In most instances, the canals and their contents co-operate to favor expulsion, and we thus find the substances contained in the stomach forcibly expelled in order to dislodge a foreign body situated in the œsophagus. Moreover, the air is violently expelled by the spasmodic action of the expiratory muscles in order to bring away inspired bodies, or those which have been introduced into the nasal fossæ. In the same way the urine is allied with the contractions of the bladder in the effort to expel the bodies which may have entered the urethra. Sometimes the action of the secretions is greater than that of the canals; this happens in all the canals of the glands which are not provided with a contractile reservoir. A body which the urethra has a tendency to "swallow," as I have remarked above, may be expelled by the mere action of the urine.

Finally, we must admit that there are some circumstances under which nature is very poor in resources for removing the objects. I will mention, as an example, the external auditory canal, which does not possess sufficient secretion to favor expulsion, and the inextensibility of which destroys its power. It does not appear to react except by exquisite sensitiveness, which rapidly gives rise to inflammation, often ineffectual, and sometimes, also, extremely dangerous.

Do these expulsive efforts, when present, often succeed? We must admit that their action is not so satisfactory as we might be led to believe, and much remains to be done by art. There would be great difficulty in stating what part would relieve itself by spontaneous expulsion; nevertheless, we may say that these efforts of nature are very frequently crowned with success in the digestive tract, except in cases in which a sphincter is interposed between the outlet and the body, as occurs with regard to the sphincter ani, which by its spasmodic contractions paralyzes those of the rectum, however energetic they may be, and with regard to the glottis, the occlusion of which arrests a body thrown upward by the expired air. The size of the body and its irregularities are not immaterial in such expulsions. The efficacy of coughing is well demonstrated with regard to movable foreign bodies in the trachea, etc.; but more than once these expulsive efforts have been followed by disastrous effects, especially when the body presented irregularities. In fact, sharp bones, and pieces of a set of teeth arrested in the œsophagus near the cardia, have been known to plunge their points still deeper into the mucous membrane and the adjacent organs, in proportion as the efforts of vomiting followed one another more rapidly. Terrible symptoms have been observed in consequence. We may include in this same category the cases in which an irregular body in the air-passages has been projected against the inferior vocal cords, where it became fixed; and firm, pointed bodies in the bladder have been plunged into its walls and into the adjacent parts, under the influence of these unfortunate and useless efforts.

At what period does expulsion occur? We may state that it has been

observed at all periods, but that in general there are more chances of its production if the accident is more recent. When a body enters the air-passages, the cough, which is immediately produced, sufficiently indicates the rapidity of the expulsive efforts; they appear somewhat later in the œsophagus, stomach, and bladder. Sometimes they are very tardy, especially when the body has been immovable for a long time, and when an inflammatory process has been necessary in order to render it movable. Thus, we find that bodies which have remained in the bronchi for years are suddenly rejected in the midst of a paroxysm of coughing; moreover, coins which are lodged in the stomach may be vomited after they have remained in this organ for several years.

b. The elimination of foreign bodies from the natural passages occurs by a similar mechanism in all, and has been described in speaking of primary or secondary perforations. I will waive the consideration of the mechanism of this elimination, which causes bodies which have been arrested in the œsophagus, bronchi, intestines, bladder, and rectum, to protrude under the skin. This has been rarely observed, except in bodies which are fixed by their irregularities, arrested by an obstacle, or which readily pass through the walls of the canal.

The elimination of foreign bodies from wounds is not less interesting. For this also, as in the natural passages, there are two methods of elimination: 1, through the track of the wound; 2, through a natural or accidental channel. The first and indispensable condition, and one which explains the so frequent persistence of the symptoms, is the mobility of the offending body. This occurs much more promptly when the body is situated more superficially and in the soft parts. The two factors which play the principal part in this process are suppuration and the action of the granulations. In fact, the one isolates the foreign body, produces pus which has a tendency to carry away the body, and the other pushes it on for a certain distance. If this process is sometimes very rapid, it is, on the contrary, very frequently of an exasperating slowness, especially in bodies enclosed within bones.

If the body is situated so deeply that it cannot be tolerated, it will have a tendency to be eliminated through the shortest channel, and it will be directed toward the region in which the skin or mucous membranes are nearest to it. Surgeons, and especially those serving in the army, have long recognized that the offending bodies open toward the nearest portion of skin by means of an abscess. The same proposition also holds good when a body is situated closer to a mucous membrane than to the skin. In both cases, moreover, the mechanism is the same.

A phlegmon forms around the foreign body and results in a collection which tends, according to a well-known law of general pathology, to protrude under the skin of the nearest region, and to open there. This pus pushes the body out and extrudes it in the most fortunate cases, that is to say, in those which are the subject of the present chapter. The same thing occurs when a bullet, for example, is found in the vicinity of an excretory duct, or of a tube with two openings, like the intestines. These bodies, after having formed an abscess, have more than once passed into the bladder, the urethral canal, or intestines.

The process of elimination always occurs when the body is not tolerated, but it often progresses very slowly, and it has been found unaccomplished more than twenty years after the wound. In fact, a large number of circumstances prove obstacles to its action; among these we may mention the hardness of the osseous parts which enclose the body or prevent

its displacement, and the irregularities of the body itself which are unfavorable to its movement.

2. Chronic and Remote Symptoms.

Under this heading I will now study the symptoms which accompany the presence of the foreign bodies which have not been tolerated, or which, after a longer or shorter period of latency, become a source of irritation to the parts. As in preceding sections, I will examine, from this point of view, the bodies in the natural channels and those in the wounds, in succession. However, the details into which I entered in discussing the primary symptoms, will permit me to be brief with regard to this second part.

As we have seen, foreign bodies in the natural passages may cause reflex and functional disturbances, and, finally, may also act by compression.

Almost all the symptoms which result from these numerous causes may pass into the chronic condition, and are consequently observed a long time after their introduction. Nevertheless, the initial reflex symptoms may disappear or lose their severity. In some cases they give way to other very serious disorders of a similar origin. Epilepsy has been several times caused by the prolonged stay of foreign bodies in certain canals. Boyer and Wilde, for example, have observed it from foreign bodies in the auditory canal; in the first case, a glass ball had remained there for eight years. Furthermore, some foreign bodies appear to have led to very curious symptoms, such as disorders of the intelligence, from their mere presence in the air-passages. It is very difficult to understand how a body, lodged in a bronchus, may give rise to loss of memory, etc.

But the most severe reflex disorders are those which occur in the glands when the body is situated in a duct. I have already had occasion to draw attention to this point, and I will now merely lay stress upon the results of this action. In many canals, the altered secretion has a tendency to deposit salts upon the foreign body, giving rise to nucleated calculi. The organs most adapted to the formation of this variety of concretions are the bladder, the salivary and biliary ducts, and the intestines. They have also been observed in the bronchi, but their manner of formation is not the same, and these deposits usually remain separate from the foreign bodies.

The deposits increase little by little, they become more irritating to the organs, and may produce obstructive, compressive, or inflammatory symptoms, according to circumstances. Sanchez de Toca saw one of these calculi which had formed in the intestines and had attained a weight of 600 grammes.

Sometimes the nature of the body gives rise to peculiarities in the shape of these concretions. Hence the clustered calculi in the intestines and bladder, which have formed around the stems of plants, etc.

The reflex change also affects the glandular parenchyma itself, and may little by little produce serious lesions in the kidneys, glands, liver, parotid, etc. Hence, the nephritis which is so frequent in calculous affections, and which can only be explained by a simple propagation of the vesical inflammation, *per continuitatem.*

The natural passages are not alone the point of departure for reflex disorders, and bodies which are lodged in the tissues may gradually lead to severe disturbances in other parts of the body. In the same manner

that epilepsy has been known to follow the presence of foreign bodies in the canals, this affection has also been observed after enclosure of a small body in the cheek. A piece of wood lodged in a tooth may also become the source of neuralgic symptoms in the trigeminus.

Is it still further necessary to recall the pains which may follow the presence of bullets in the limbs, the tetanus which may result therefrom, and the trophic disorders, more or less remote from the site of the offending body? But all these facts yield precedence to the sympathetic disturbances which foreign bodies in one eye produce in the other. Every one knows, in fact, how dangerous it is to abandon a body which appears to be tolerated in the eye, because at the end of a period, which may not be less than thirty or forty years, sympathetic inflammation sometimes occurs.

The functional disorders are in direct correlation with the preceding, and with the inflammatory or mechanical symptoms. For a certain length of time, when the stay of the body is compatible with life, the local disturbances are scarcely appreciable, but they soon react upon the general condition.

It is unnecessary to state that the importance of the function plays the principal part in the rapidity of these symptoms, and that marasmus occurs much more quickly in consequence of the presence of foreign bodies in the trachea and intestines than in the bladder, and, in general, in all the glandular ducts.

The entrance of a hog's bristle into Wharton's duct will never give rise to symptoms sufficiently grave to compromise life, because the abolition of the functions of one of the submaxillary glands is not of such a character as to threaten existence. There is either an interference with the function, which is usually the case, or complete abolition. There is nothing astonishing in the fact that a child, who has a pea in his ear, cannot hear upon that side; that an eye, which is the seat of a foreign body, is amblyopic; and that a nasal fossa, which is closed by some abnormal body, does not functionate.

The parenchymata themselves, after they have been the seat of foreign bodies for a certain length of time, become changed, and their disturbed functions always give rise to serious disorders of the general harmony of the parts. It has been long known that missiles, arms, and projectiles have been arrested in the brain without affecting the life of the patient. This fact is true; but after a longer or shorter interval the intelligence at times becomes more obtuse, the memory is lost, and partial paralyses are produced. In the same manner, bullets which have lodged in the lungs interfere appreciably with the respiratory functions and give rise to phthisis. In a word, all foreign bodies of the natural channels, like those of wounds, may slowly develop a condition of marasmus.

Chronic obstruction is more rare than the acute, because the gravity of the symptoms which result from it attract the attention of the surgeon, or lead to a fatal termination. In all cases it is necessary that the discharge of the body be prompt. Can we conceive that the urethra may remain obstructed for a long time, that the œsophagus does not functionate any longer, etc.? Evidently not, and if the obstruction becomes chronic in any part it will be in an unimportant or secondary canal, the contents of which can be eliminated through another channel. Such, for example, is the nasal canal which may be the seat of persistent foreign bodies that obstruct the lumen and force the tears to flow outside from the inner angle of the eye. Moreover, the obstruction very rarely becomes

chronic unless, as I shall soon show, it is the result of an inflammatory process.

I will restrict myself now to a determination of the effects of chronic inflammation, of which I have fully spoken in discussing the symptoms due to irritation. When it is localized in the natural passages or in the cul-de-sac of wounds, it may pass into the chronic condition and then present itself, in the first instance, under the form of ulcerations of the canal, and in the second, under that of fistulas. Both are maintained by the persistence of the foreign body, and these affections have no tendency to recovery so long as the irritating substance is present. If suppuration does cease for a while, it will reappear after a longer or shorter period. When the foreign body disappears, either because it passes into the adjacent tissues, or is expelled or eliminated, the inflammation gives place to cicatrization, which proceeds, as usual, from the deeper parts to the more superficial. Thus fistulous wounds and ulcerations of mucous membranes heal up; but all the symptoms have not by any means disappeared in the latter case, as the mucous membranes of the canals cannot cicatrize without the production of a retractile tissue, which, by retracting, diminishes the lumen of the canal, producing cicatricial strictures and all the disorders which result therefrom. The œsophagus, intestines and rectum present this variety of late complications.

At other times, the ulcerations persist, despite expulsion or elimination, either because the time necessary for cicatrization was too long, or because the parts in which the body was situated, having become affected, were no longer susceptible of rapid recovery. Hence, the diarrhœa persists, after the expulsion of a certain number of foreign bodies from the intestine, and osseous fistulas suppurate for a long time after the extraction of projectiles.

Among these chronic or remote symptoms of an inflammatory origin we must class all complications of tolerated foreign bodies. I have stated that the formation of a cyst places the adjacent parts under shelter from the irritating contact of the offending body, and that this protection was not indefinite, but susceptible of modification by a large number of causes. Now, the changes which occur in these cases of tolerance are always the same, and belong to the inflammatory symptoms. In one case, it is a bullet lodged in the brain for twenty years, whose cyst inflames and becomes purulent; in another, it is a tibia, which for thirty years has tolerated, without irritation, a bullet received during the campaigns of the First Empire. Suddenly the symptoms appear with such an intensity that they endanger life, and render amputation necessary. The time which has elapsed since the accident is of little importance, since old men have found wounds reopen, which contained projectiles that had been tolerated for more than twenty years.

I will also place in this category the abscesses which form under the skin when migrating foreign bodies have become superficial, and the ulcerations and perforations of the bones by projectiles which have remained in the face for a certain length of time; the frequent cheesy changes in the lungs, due to foreign bodies in the chest; the thromboses produced by penetrating bodies of the heart; the aneurisms in the vicinity, etc.

This does not hold true of neoplasms, which cannot be explained by the prolonged presence of foreign bodies, though the older authors report a certain number of cases, in which they regard this origin as undoubted. Thus they have regarded foreign bodies in the œsophagus as favorable to

the development of scirrhus. If we take into consideration their crude knowledge with regard to these strictures, they may be right in applying this term to these affections, but nothing up to the present time permits us to affirm that these foreign bodies produce, at the place where they are located, a *locus minoris resistentiæ*, in which the diatheses make their appearance.

Death from Foreign Bodies.

We must, above all, recognize the fact that all foreign bodies are not capable of compromising life. Those which are lodged in the salivary canals or urethra have never produced death, and the canal or tissue involved must possess a certain importance, in order that this termination should occur.

Faithful to the plan which I have marked out, I will, in succession, pass in review the various symptoms which foreign bodies may produce in the natural passages and in wounds, calling attention to those which most frequently lead to a fatal termination.

On the one hand are found those causes of death which result from its mere presence (obstruction, inflammation); on the other are those which result from mechanical action (compression, perforations of all kinds). Each of these varieties merits further attention.

We are not justified in saying that reflex disorders may cause death, and the instances of death in the midst of epileptiform attacks (they are extremely rare) may be explained by other means. But the obstruction has often had disastrous consequences, chiefly in important natural canals, such as the respiratory passages and digestive tract. If a piece of meat has occluded the vestibule of the larynx, the individual falls dead from instanteous asphyxia, as if struck by lightning. I do not know of any other examples of sudden death from foreign bodies in the natural canals. It occurs in the same manner, but more slowly, when a body is arrested in and obstructs the entrance of a large bronchus. The deglutition of alimentary matters may be arrested, the patient runs the risk of dying from inanition, and science possesses examples of this character. In the lower portions of the intestinal canal, the disastrous effects of intestinal obstruction have been more than once observed, leading to perforations and ruptures, with rapid peritonitis and gangrene.

The inflammatory symptoms do not yield in gravity to the preceding, especially when they are propagated to the neighborhood, and attack the serous membranes or delicate parenchymata. Bronchitis and pneumonia from bodies in the air-passages, œsophagitis and deep collections in the neck and mediastinum from those in the œsophagus, and peritonitis from foreign bodies in the organs contained in the abdomen, are serious complications, from which few escape. The vicinity of the brain and meninges renders, for the same reason, the consequences of the presence of foreign bodies in the ear much more grave.

A large part of the mortality following the introduction of foreign bodies is due to mechanical action, because it acts persistently, and places the tissues in contact with the contents of the cavities, by means of the primary or gangrenous perforations. These perforations cause death by making a communication between two canals, the functions of which are absolutely incompatible, as the trachea and œsophagus; they open the serous membranes (pleura, peritoneum), and give rise to the most acute and threatening inflammatory symptoms. They have caused,

perhaps, a larger number of deaths than all the other causes combined. Peritonitis has carried off a large number of patients who suffered from foreign bodies in the intestines, stomach, bladder, and rectum. Nor must we forget the perforations of the large vessels of the thorax and abdomen, since these incurable lesions always cause death in a very short time.

All the preceding causes of death act very promptly; the others are very slow, and lead to the cachexia or marasmus of foreign bodies. These are especially observed in the large natural passages, like the digestive tube, respiratory passages, and genito-urinary organs. In the air-passages, death occurs from pseudo-phthisis, in the intestines from the general emaciation and decline which results from digestive disorders, and in the genito-urinary organs from nephritis, pyelitis, and disorganization of the kidneys.

Death occurs less frequently, perhaps, as a consequence of the presence of offending bodies at the bottom of wounds, and this is readily understood, as the mechanical action, which is so injurious in the natural channels, is almost entirely absent in these cases. But what are the other complications, outside of the functional disturbances, which may result from the presence of a projectile in the centre of an important organ? One of the most evident effects of the presence of a foreign body in wounds is to delay cicatrization. But on this account they expose the organism much more to the development of contagious or other affections, erysipelas, lymphitis, septicæmia, tetanus, etc. These are the complications which especially darken the statistics of foreign bodies from "effraction." They may also produce death a long time after their penetration, if they are situated in the lung, in the vicinity of a serous or articular cavity, etc. The best marked cases of tolerance have been very frequently followed by terrible relapses, either inflammatory or otherwise. Is it not strange to find that a needle embedded in the heart, in which it had been tolerated for a long time, produces coagulation which may give rise to embolism, either of the pulmonary or of some cerebral artery? In conclusion, death from foreign bodies in wounds is due: 1, to initial inflammatory symptoms; 2, to secondary complications; 3, to remote symptoms.

After the preceding remarks, I think it would be useless to discuss the prognosis in a special chapter, as it would be difficult to state general precepts without repeating the entire contents of this last section.

CHAPTER VIII.

DIAGNOSIS.

Nothing is easier than the diagnosis of foreign bodies in certain cases, but nothing is more difficult in others. How simple when the patients or witnesses of the accident inform the physician of it, and desire him to treat an unfortunate who has swallowed a bone or a bean, an infant who has introduced some body into the nose or ear, a wounded man who has received a gunshot injury! In addition to these cases, in which

the path is already clear, how many others are there in which indications are entirely wanting, in which the physician is confronted with accidents which hide their beginning and primary cause, and in which it is impossible to employ the senses for the exploration of the deeply situated parts. In view of these infinite varieties of practice, the physician should draw a line of conduct in order to arrive at a diagnosis, and for this purpose he should draw his information from the following sources:

1. Previous history.
2. Subjective or functional symptoms.
3. Objective symptoms. Exploration.

With the aid of these various data, the surgeon is able to arrive at a knowledge of the existence, situation, and nature of the foreign bodies. Thanks to them, he cannot only foretell the symptoms which their presence and mechanical action produce, but also prevent them, and apply to each particular case its appropriate treatment. This is the end toward which the diagnosis and investigation of foreign bodies must tend.

1. Previous History.

The intelligence furnished by the patients is of two orders, according as it is told by the bystanders, the relatives, or the patient, or according as it follows upon questions put to the patient. This distinction may, at first sight, appear puerile, but it is of importance, because very frequently the information is only obtained through the sagacity of the physician.

Whenever the cause of the symptoms is accidental, and they do not prevent the patients from telling what has happened, the utility of the previous history is undeniable, and we should never fail to make the patients tell all they know about the nature of the foreign body, the circumstances connected with its penetration, and the symptoms which have followed its introduction. Unfortunately these conditions are not always realized; thus, very young children cannot speak, and it is useless to expect information from them which they cannot give; lunatics, who play such a large part in the category of intestinal foreign bodies, do not wish to speak, or their irrational language cannot be believed. Finally, the severity of the primary symptoms renders it impossible for the patients to express themselves; for example, after the ingestion of bodies which have been arrested in the pharynx, or in the larynx and air-passages.

When the accident is the result of low passion, information with regard to the penetration of the foreign body is very frequently wanting, as the patients do not dare to give its history.

Finally, under numerous circumstances, the patients cannot state what has happened, because they were either unaware of it themselves, or the accident was the result of circumstances which passed unnoticed. How can an individual know that the formidable abdominal symptoms, which have suddenly developed, are the results of the ingestion of a raisin-seed at some unknown period, or of an agglomeration of cherry-pits?

In order to overcome this difficulty the physician should, in the first event, examine the surroundings of the patient, and, in the second, draw out instructive answers by able questions. The relatives usually relate what has happened to the children, and in what conditions they found them; at this age, foreign bodies occur most frequently in the digestive tract and in the air-passages, and the accident almost always happens from playing with the swallowed object. They should show us, if possi-

ble, a foreign body like that which has been introduced, and this practice, which is especially useful in the preceding cases, is not less so in others.

Among the insane the physician should not neglect even the strange information which is furnished by them. More than once the error committed has been recognized on autopsy, and the stomach of the insane has been found to contain knives, spoons, and forks, which they had swallowed several years previously, although no attention had been paid to their statements.

But the task of the physician becomes very difficult when he is confronted with individuals who do not wish to disclose anything, or who divert suspicion by false stories. Women especially acknowledge their faults with reluctance, leaving to the physician the pains of discovering the cause of their trouble. In these cases, which constitute a large part of foreign bodies of the urethra, bladder, vagina, and rectum, two events may happen. Either the patient tells a story, or he does not. It is immaterial to the surgeon to know whether the story is true or false. However improbable it may appear, he must accept it without expressing the least doubt in order to ascertain the nature of the body introduced, a factor which is alone useful. He must concede the story of a girl who states that she fell from a tree upon a small piece of wood, which, by a most remarkable accident, has entered her urethra. He must not refuse credence to the most foolish histories, such as that of the individual who related that a pencil which he had in his pocket, had, in falling, entered his bladder. In this manner the physician inspires his patients with confidence; he must especially avoid questioning them in public and before other patients, in order to facilitate their confessions.

Sometimes the physician may, by adroit questions, arrive at a suspicion of the cause of the symptoms, by inquiring into the habits of the individual, his usual condition of health, and the previous occurrence of similar phenomena. If we recognize the presence of symptoms of obstruction, we should suspect the unconscious introduction of foreign bodies (various kinds of fruit-stones, bone, etc.).

It is especially with reference to the diagnosis of foreign bodies in the natural channels that the previous history renders good services, but it is also important in those found in wounds. It is well to know the character of the fire-arm or projectile, whether the latter is entire, rusted, pointed, etc., and whether it has been extracted or has extricated itself. All these considerations are really important, because we must be on our guard against involuntary errors of the patients who state that they have seen the bullets extracted, although they are still lodged in their limbs. Nevertheless, I am inclined to believe that facts of this kind have been very much exaggerated, and I cannot admit that we should adopt mistrust as a surgical precept.

2. Subjective Symptoms and Functional Disorders.

The information which the surgeon obtains from this source is of a very peculiar nature, but it has its value, whatever writers say to the contrary. They are undoubtedly incapable in themselves of revealing the existence of a foreign body, but, in addition to the fact that they often arouse our suspicions and thus put us on the track, they may also be useful because they indicate the situation and the degree of tolerance of the body. If they often fail us, there are other circumstances in which doubt

is barely possible. Are not the majority of foreign bodies in the œsophagus or trachea accompanied by a series of characteristic phenomena? No affection can be likened to the initial paroxysms in these two channels, and if any doubt exists in some cases concerning the exact position of the body in one or the other, it is very easy to remove it by a proper exploration.

The character of the pain (acute, piercing, dull) may aid in the diagnosis. If we are able to produce an acute pain by pressing upon the antero-lateral region of the neck, we are justified in assuming that the swallowed body has been arrested at this point. In this manner we can render the diagnosis more precise by the aid of these symptoms. What is true of the pain will hold equally with regard to other symptoms or functional disorders. They are not peculiar, but they are useful in themselves and in their entirety, and they frequently corroborate the data furnished by the patient and by exploration.

But I admit that they may lead to error, and that, even when added to the clinical history, they are insufficient to form a diagnosis in all cases. A man consults a surgeon because he has trouble in one eye; he states that he has suddenly experienced acute pains, which compelled him to rub it, and that everything led him to believe that some dust, or foreign body, had lodged under the lid; he even adds that he thinks he feels sand. Does not this entire group of symptoms indicate the existence of a foreign body in the conjunctiva? And yet every physician knows that this array of symptoms and the clinical history much more frequently indicate a catarrhal conjunctivitis. Exploration then becomes necessary, in order to complete the diagnosis. At other times, the symptoms produced are not proportionate to the cause, and it is very rarely that an attack of epilepsy will lead us to think of the possibility of a foreign body in the ear.

In conclusion, among all these symptoms, only functional ones, such as those of compression and obstruction, will aid us in making a diagnosis.

3. Objective Symptoms.—Exploration.

The objective symptoms are perceived by the aid of the senses, and these organs are our most valuable aids in arriving at a diagnosis. In their order of importance, I will mention sight, touch, and hearing; thanks to these, whether they act alone or are aided by various instruments, the surgeon can explore the cavities of the organism and accidental wounds, with a certainty which increases as the foreign bodies approach the orifices, or are more superficial. Each organ requires peculiar methods, which cannot be entered into in a general study, and which will be specially described. Now we can only refer to general views, based upon a few examples taken at hap-hazard in the history of foreign bodies in the organism.

Sight is a very useful sense in the diagnosis of foreign bodies, but its compass is not very large, because so many bodies are beyond its range. Its action is very much lessened beyond the first portions of the natural cavities which are readily accessible, such as the mouth, pharynx, ear, and conjunctiva, either because the winding organ does not permit the entrance of light, or its narrowness prevents the introduction of luminous rays. Thus, sight is of no service in foreign bodies of the urethra, the glandular ducts, œsophagus, etc. The surgeon should remedy these

imperfections as far as lies in his power, and, for this purpose, arm the sense of sight by instruments which facilitate both the arrival of luminous rays at the bottom of natural or accidental cavities, and the perception of objects. In order to fulfil these indications, it has naturally been necessary to devise some special instruments for each cavity. If we wish to carefully examine the pharynx or larynx, we may resort to the laryngoscope, the employment of which is now familiar to many physicians, and has enabled them to recognize the existence and position of a large number of foreign bodies in the pharynx or air-passages. We must also refer to the utility of vaginal and rectal specula and of the otoscope, for foreign bodies in these regions, and in the external auditory canal. In the same manner, the ophthalmoscope has more than once revealed the presence of particles of lead or other bodies, which had lodged in the deeper parts of the eyeball. In fact, wherever we can introduce dilating instruments, we can also introduce light; but the data become less precise according as the body is situated in a narrower canal, and at a greater distance from the natural orifices. Sometimes—thanks to the accidental presence of a counter-opening along the length of a canal—we are able to approach the foreign body, and thus place it in the most favorable condition for discovery. On account of this ingenious idea, Voltolini was able to discover a foreign body in the air-passages, by introducing a speculum, analogous to that of Brunton, into the wound of a patient who had undergone tracheotomy. But such methods are exceptional, and are not more employed than Desormeaux's endoscope for the urethral canal, and which is restricted to a few special cases. The naked eye may serve for a mere inspection of the parts—in a very small number of cases, it is true—when the foreign body projects at the surface of the integument or mucous membranes. Ingested bodies have been known to lift up before them the wall of the œsophagus and the soft parts of the cervical region; even the larynx has been thrown forward to such an extent, that the supra-hyoid region was affaced. Wherever the canals are superficial, the presence of the foreign bodies produces abnormal projections, which may clear up the diagnosis very much, even in very obscure cases, such as those in which foreign bodies of the stomach or intestines lift up their walls. Sight gives us information concerning the existence, color, situation, position, and, up to a certain extent, the form of the foreign body.

By touch, the surgeon acquires very exact ideas, not alone concerning the existence of the body and its situation, but also its consistence, irregularities, and absolute or relative mobility and fixity; in a word, touch is a very useful complement of visual exploration, and supplies desiderata in which the latter fails. But, like sight, touch cannot always act directly, and we must come to its aid by various devices; hence, there are two primary varieties of tactile sensation—those furnished by direct touch, and those which result from indirect touch. We must also refer to the ideas which the surgeon may acquire by palpating a region through the integument, and which belong to mediate touch.

The action of the finger, so useful when it is possible, does not extend beyond six or seven centimetres, and it is, consequently, restricted to orifices of cavities, or to short tracks of wounds. The index finger is universally employed in such cases, on account of its length and exquisite sensibility. The substitution, in some countries, of the little finger in the exploration of wounds, is done in order to avoid distention of the frequently very narrow track which the projectiles make. By the aid of

touch, we can explore the orifices of large cavities, and even the latter themselves; these include the mouth, pharynx, vagina, and rectum. But several of the natural canals, accessible to exploration, do not permit the introduction of the finger, and, consequently, the application of the sense of touch, on account of their narrowness. The urethra, auditory canal, and nasal fossæ belong to this class, and we cannot properly, under these circumstances, enlarge the orifices, as is so frequently done in wounds which are too narrow to permit ready exploration.

In such cases, and also in those in which the depth of the cavities does not permit the introduction of the finger, we must resort to instruments which transmit to the hand certain sensations of contact sufficient to denote the existence and consistence of the foreign bodies. These notions are undoubtedly very valuable, but they are far from being as important as those which are furnished directly by sight and touch. For this purpose the surgeon makes use of a host of instruments, such as sounds, catheters, stylets, electrical istruments, forceps, punches, etc., which by various means arrive at the same end, viz.: the disclosure of the presence of the body.

Resort is had to stylets or lead sounds in cases of wounds. When the latter are insufficient, and do not give satisfactory information, we may advantageously make use of the ingenious apparatus which carry away, by their contact, a portion of the foreign body, and permit an inspection, or even analysis, of these particles (stylet of Nélaton, and of O. Lecomte). Since the time of Favre, of Marseilles, electricity has been applied to the discovery of foreign bodies, in order to remedy the imperfections of sounds and stylets, and to render the diagnosis more certain. The principle is the same in all these instruments, viz., the establishment of a current by the contact of two ends of a wire with a metallic foreign body. The interposition of a galvanometer, or an electrical bell along the course of the wire, is sufficient to disclose a bullet or piece of shell.

Instruments render equal services in the diagnosis and examination of foreign bodies in the natural passages; according to the various regions, the catheters assume various forms. They are employed for the œsophagus, anus, and especially the urethra and bladder, and, in general, for all the canals which are inaccessible to direct touch.

Finally, palpation is a useful adjuvant in diagnosis; it is less precise than the other means, but it has the advantage over them of being inoffensive, and, for this reason, it can be employed without a resort to instruments. It is a rule generally adopted in military surgery to palpate the regions in which we may reasonably locate the foreign bodies before introducing exploring instruments; and it very frequently happens that the hand feels a bullet, which has been arrested under the skin of a limb, on the side opposite to its entrance. This fortunate circumstance evidently dispenses with all further measures, and we thus avoid the inconveniences which sometimes result from attempts at exploration.

Palpation is equally applicable to the search for foreign bodies in the natural channels, when these canals are accessible to the touch. Upon taking the œsophagus between the tips of the four fingers, opposed to the thumb, it is possible to detect a foreign body within the organ. In the same manner it has more than once succeeded in detecting a foreign body arrested at the bottom of the iliac fossa, by depressing with the fingers the skin of the hypogastric region. I will not leave this subject without mentioning the special usefulness of the introduction of the hand into the rectum—not alone for the diagnosis of foreign bodies in the latter, but also in the genito-urinary organs.

The sense of hearing renders the physician much less important services than the other senses; but for some years, thanks to the continued improvements in acoustics and instrumentation, this source of examination appears to be entering upon a new phase. It is certain that science has not had its last say upon this question, and that the benefits to be derived from it will become more appreciable in the future. In the actual condition of science, hearing, whether aided or unaided, can only be employed in a small number of cases. Praise has been bestowed upon auscultation of the œsophagus, by Hamburger's method, in order to determine the modifications which a foreign body produces in the bruit of deglutition. More recently Collin has devised a resonating instrument in order to transmit to the ear the sound produced by the shock of a metallic sound against bodies lodged in the *primæ viæ*, the œsophagus or stomach. I will also mention the utility of these instruments in the diagnosis of bodies in the bladder and urethra. However, all these methods, including auscultation of the stomach or intestines combined with succussion, are still not well regulated. Fortunately this is not true of auscultation of the chest, which is of great service in the diagnosis of all pulmonary affections. Is there a better sign than auscultation in determining the situation of a foreign body which is lodged in the bronchi? The absence of vesicular breathing without dulness in a well-defined region furnishes the physician with the most valuable elements in diagnosis. Furthermore, the sense of hearing enables the physician to determine the clacking or chattering bruits which the passage of air produces upon meeting bodies which are fixed in the larynx.

With regard to the other senses, smell and taste, their utility is almost nil, and I pass them by in silence. To sum up, all the sources of investigation which can lead the surgeon to a diagnosis of the existence, form, and nature of the foreign bodies, are obtained by the aid of sight, touch, and hearing. But we must add that they may lead to mistakes; sight itself may be at fault, and there are examples on record of mistakes after laryngoscopic examinations, a fixed body in the mucous membrane being either mistaken for another affection or being overlooked. Touch is much more frequently found at fault, and, when uncorroborated by the sense of sight, may lead to gross errors. Thus sponges lost in the fundus of the vagina have been more than once mistaken for cancers of the uterus; and in these cases the olfactory sense renders deception much easier. The opposite mistake has been also observed, and the fungous growths surrounding a pessary which has been forgotten for a length of time may lead us to diagnose a similar affection.

If direct touch may lead to error, how much less precise is indirect touch, and how much more capable of misleading the physician! At the proper time and place I will report a number of facts, showing that these mistakes have been committed, both with regard to the natural passages and to wounds, by men of recognized ability.

A general chapter does not permit a discussion upon the opportunity for exploration according to the special cases, and as precepts of this character have no necessity for existence except in practice, I will reserve their discussion until we treat of the special groups of foreign bodies.

CHAPTER IX.

TREATMENT.

1. Indications.

Two grand methods present themselves to the surgeon in the treatment of foreign bodies, viz., the expectant plan and that of interference. At first sight they appear to correspond to the two classes which I established in the general history of foreign bodies, by ranging upon one side the phenomena of tolerance, and, upon the other, those which accompany the accidents. But after having made the diagnosis, the surgeon does not always know the final termination of the wound or foreign body, so that in certain cases there may be a necessity of extracting an inoffensive body from the organism. On the other hand, a foreign body, which at one time gives rise to the most acute symptoms, may become indolent a few moments later. A hasty interference in such cases would be more harmful than useful, and I shall first devote myself to a determination of what the conduct of the surgeon should be. Then I shall unfold, in a second part, the general methods by means of which the surgeon fulfils the indications for treatment.

We must admit as a principle that it is better to rid the organism of foreign bodies which have entered from without, than of abandoning them to their own resources. But this rule, which may serve as a foundation for all that follows, is not susceptible of practical application in all cases, and in these the expectant plan is indicated.

First counterindication.—Whenever the surgical interference necessary to relieve the organism of a foreign body exposes it to greater risks than the symptoms which are present or which may occur, we must abstain from it.

These considerations are necessary, and I will adduce illustrations among the foreign bodies of the natural passages and wounds. A person, in falling, has buried a needle into the knee, and the offending body has broken, leaving one part at the bottom of the wound, and involving, perhaps, the synovial membrane of the joint. Should the surgeon, following out the general principle, cut into the integument and joint in order to extract this portion of the needle? If he does so, he runs great risk of lighting up in the part a very acute inflammation, the consequences of which are incalculable. He should abstain from all active treatment in the beginning.

Here, on the other hand, is a patient who has swallowed a large body like a fork; this body has not been passed, and is lodged in some part of the intestinal canal, the exact position of which is unknown. What should be the plan adopted by the surgeon? Should he endeavor to produce expulsion, extraction being impossible? Undoubtedly, but all his measures are very ineffectual, so that nothing remains to him but the broad alternatives of expectancy or surgical interference. No one would think of making an incision into the peritoneum and intestines in order to extract a body which does not endanger the life of the patient immediately, and the complications of which, if they developed (which is problematical), would not possess more gravity than the operation.

We must then desist in such cases, and these are not the only ones of this kind. I am well aware that this first counterindication gives the surgeon very great latitude, but it must be remembered that I am only referring to general views in this chapter.

Second counterindication.—Interference must not be resorted to when the situation of the foreign body is not accurately known. Evidently the first question which presents itself to the surgeon is to discover the situation of the foreign body in the organism. Larrey and Jobert de Lamballe never dared to apply the trephine to the skull unless they knew by exploration and the general symptoms that the bullets received by the patients were lodged in the cranial cavity. How can a projectile be extracted which is deeply imbedded in the muscles? What is true of wounds is not less so of cavities, but these conditions are more rarely realized in them, as the canals are usually more open to exploration. If a swallowed body is lodged in the intestines, should the surgeon incise the walls of the abdomen without knowing where the object is? Even apart from the symptoms which an injury to the peritoneum produces, the operation is liable to be useless or fatal. The conditions are very different when the body gives rise to symptoms, if there is obstruction, for example, because it is then necessary to act quickly, and because pathology permits us, up to a certain point, to recognize the site of the obstruction, and to differentiate that of the small intestines from that of the colon. To sum up, all other things being equal, the surgeon should be so much the more reserved, the more uncertain the diagnosis.

Nevertheless in many cases he must act, despite the uncertainties of diagnosis, when the case is urgent and some immediate symptom threatens the life of the patient. Foreign bodies in the air-passages are frequently found under such conditions, and at times those of the œsophagus. Must we persist in the expectant plan when the situation of the foreign body is unknown? Evidently symptomatic treatment, which is palliative to a certain extent, must be adopted, and for this purpose surgical interference is warranted. How often has tracheotomy been performed before the diagnosis of the situation, and even of the existence of the foreign body, has been made! Nevertheless, thanks to this rapid interference, patients have been saved, the imminent asphyxia has disappeared, and the surgeon has then been able to direct his attention towards searching for and extracting the foreign body. Not only are these operations performed upon the organ which is the site of the foreign body, but also upon adjacent regions on account of the gravity of the symptoms of compression. Upon several occasions a tracheotomy performed for bodies which had been ingested and lodged in the œsophagus has put an end to asphyxial symptoms. This rule may be formulated in the following manner: *Symptomatic surgical interference is always indicated whenever the case is urgent, even though the diagnosis has not been made.*

THE VARIOUS METHODS OF TREATMENT.

The treatment of foreign bodies is either prophylactic, palliative, or curative. The first two have only a moderate importance compared to the third.

1. Prophylactic Treatment.

The usually accidental origin of foreign bodies renders almost useless the preventive measures which the surgeon may advise. An enumeration of the causes which produce the accidents is sufficient to cause their avoidance, and it would be puerile to devote useless details to this part of the subject. In general, the hygienic precautions in eating and drinking, the daily care of young infants, the most careful attendance upon individuals devoid of reason, etc., will succeed in diminishing the number of accidents. But, in addition, the physician may, by an appropriate regimen, prevent the accidents caused by an organic or functional defect in an organ, and, in this regard, the prescription of a suitable diet enters into the prophylaxis of obstructions of stercoraceous origin; for similar preventive purposes eye-glasses are recommended to workmen, etc.

2. Palliative Treatment.

By palliative treatment I mean the application of a certain number of remedies, or even of surgical interference, which have no other object than the relief of the chief symptoms or marked complications. I have had occasion several times to draw attention to this treatment. As a rule the surgeon only resorts to it in cases of extreme urgency, or when a foreign body, the situation of which is unknown, produces symptoms which may be relieved by certain manipulations or by special treatment.

Tracheotomy, for the relief of asphyxial symptoms produced by the presence of foreign bodies in the air-passages or œsophagus; puncture of the intestines in intestinal obstruction, in order to evacuate the fluids or gases; and puncture of the bladder, are included in this category of symptomatic remedies. In like manner we must also add the various catheterizations which permit exit through an artificial canal to ingested or secreted substances, and thus relieve the symptoms of obstruction which may be present. Almost all the symptoms may thus be treated with some chances of success, except those which result from compression and irritation, and which terminate in inflammatory symptoms or ulcerations.

3. Curative Treatment.

As I have remarked, this treatment is the only one which is really effective, and it has for its object the removal of the foreign body. It includes a certain number of measures, which, with a few modifications, are the same for foreign bodies by "effraction" and those in the natural channels. The only exception refers to bodies which are fixed to the surface of the integument and the treatment of which deserves special mention.

Curative treatment includes two classes of measures: 1, those intended for the extraction of foreign bodies, through the natural channels or the wound; 2, those which attain the same result by creating an artificial channel for the foreign body.

I. Methods of Extraction by the Natural Channels.

This group is divided into two secondary categories, according as the surgical interference is restricted to the attempt to favor natural expul-

sion or elimination, or as the surgeon resorts to extraction. In the first case, the physician aids nature, and, if necessary, produces expulsive efforts, and removes the causes which diminish its effects. In the second, he acts directly by means of instruments, in order to remove the obstacles to progression, or to extract from the organism those bodies which cannot be expelled spontaneously.

A. *Measures which aid the action of nature.*

A large number of measures have always been employed in order to facilitate the expulsion of foreign bodies from the natural passages or wounds. Although these measures are, for the most part, popular, it is nevertheless useful to know them, because they may be advantageously employed by laymen as well as by physicians, either because the indications for more active interference are not very well marked, or that the physician cannot resort to it on account of the timidity of the patient or his dearth of instruments.

Now, in order to aid nature, he must recollect the symptoms which follow the introduction of the foreign body, and produce or regulate those among them which aid in expelling the body. The measures employed vary infinitely, according to the organ involved, the nature of the body, its situation, and also according as the canal involved has one or two openings. If there is only one opening, the body must follow the course by which it has entered; if there are two, expulsion may either occur by making the foreign body retrace its path or by forcing it to pass further on and follow the normal course of the substances in the canal. The preceding considerations enable us to see that the therapeutic measures which are at the command of the physician are much more numerous in the second case than in the first.

If the canal has only one opening, the resources of the surgeon are very much restricted. Among these canals I will mention the air-passages, the urethral canal, glandular ducts, external auditory canal, and, in a general way, all wounds which have one opening and a cul-de-sac. In discussing spontaneous expulsion, I will endeavor to show the use of the secretions or the fluids which the canals or wounds contain, and, on the other hand, the action of the contractile organs which some of them possess. The efficacy of certain manipulations is much greater if the canals are provided with active contractile organs. Among these measures some are addressed to the secretion or to an ingested fluid, others to the canal itself. I will give several examples of each of these two varieties. In order to facilitate the expulsion of bodies which are lodged in the bronchi or trachea, resort is often had to sternutatories which produce cough, and to blows upon the back which are intended to displace the foreign body, and to reproduce the initial paroxysm which has temporarily subsided. In order to aid this action, the preceding measures are combined with special positions, in which the head is placed low. We thus add the action of weight to that of the intercostal muscles and diaphragm which produce the paroxysms of expulsive cough.

In foreign bodies arrested in the urethra, no one has attempted to utilize the unprofitable contraction of the fibres of this canal, but the secretion has been relied upon for the purpose of dilating the canal and expelling the arrested body. This manœuvre has succeeded more than once; it is sufficient to compress the meatus and to order the patient to urinate.

This action of the urine has been sometimes effected by the aid of injections or the preliminary dilatation of the canal by mechanical means. The efficacy of these mild measures is much less in the other glandular ducts and in wounds with a single opening, because the continuous secretion does not permit the body to be rendered movable by dilatation of the canal, and we cannot rationally imitate nature, which sometimes closes up the track of complicated wounds, and then reopens it after the pus accumulated above the cicatrix has rendered the foreign body movable. Nevertheless an operation upon the canal itself may be effective even in such cases. It includes the unbridling of glandular orifices and wounds, or, more frequently, their dilatation by means of prepared sponge and mechanical instruments. Expulsion is greatly aided in this manner.

Finally, injections into these canals replace, to a certain extent, the secretion whose action has been unavailing. These constitute the most valuable means for the extraction of bodies introduced into the auditory canal, and which have no natural tendency to elimination.

If the canal has two orifices, then to the preceding measures which are all applicable with proper modifications, we must add those whose object it is to cause the body to advance to the other extremity of the canal. As examples, I may mention the digestive canal and nasal fossæ. If we wish to aid expulsion through the mouth, we resort to such measures as will produce vomiting, and for this purpose the uvula is tickled, and emetics, enemata of tobacco, and hypodermic, emetic, and even intra-venous injections are administered.

In a similar manner, in order to force a body which is lodged in the nasal fossæ through the nares, we may expel the air forcibly through the nasal fossæ, either voluntarily or involuntarily, by producing sneezing.

If we wish, on the contrary, to aid expulsion through the œsophagus, we cause the patient to swallow water, oil, large mouthfuls of bread or of substances which dilate the œsophagus, etc. If the body is in the intestines, we can favor its progress by purgatives, or can protect the mucous membrane against its action by the ingestion of sticky substances, etc.

The preceding enumeration is sufficient to give us an idea of the resources at the command of the surgeon.

I will not leave this subject without saying a few words upon position, which has been often utilized by patients and physicians. The body has been turned upside down in patients who suffered from the arrest of bodies in the air-passages or intestinal tract. According to Servier, Legouest succeeded in expelling a foreign body from a man's bladder, by placing him upon his knees, and making him urinate in this position. Need I recall the usefulness of the precept of placing those suffering from wounds with only one opening in a position which will favor the spontaneous discharge of the foreign body? The older surgeons resorted a great deal to this measure in order to remove bullets from the chest and abdomen. They placed the patients between two cushions, the wound being below, and then rolled him in various directions, in order to facilitate the dislodgment of the body. They employed other measures for bodies in the ear, which are even more curious, and founded upon the same principle.

In this category it will be convenient to speak of the solution of foreign bodies. I will be brief upon this subject, because this action is too slow, uncertain, and problematical to be the object of serious study.

Success has been obtained in dissolving gum, which was lodged in the œsophagus, in attacking pieces of metal by means of acids, and in soften-

ing wax in the bladder. But, in reality, all these palliative measures are undertaken rather for the purpose of preparing the body for extraction, or of facilitating its progress than of dissolving it.

B. *Methods of extraction, properly speaking.*

These measures are almost innumerable, and I will limit myself to a few general indications based upon the following division:

1. External manipulations.
2. Internal manipulations.

a. *The external manipulations* are not by any means as important as the others, but they constitute a means of extraction which has rendered good service. They consist in the attempt (through the integuments) to push back the foreign bodies in such a manner as to bring them outside of the orifice of entrance. These means have succeeded in the œsophagus, which is accessible to the fingers in certain persons, and in the urethra, which is subcutaneous throughout a large part of its course. I will content myself with these few remarks.

b. *Internal manipulations.*—They must often be preceded by preparatory manipulations, for the purpose of habituating the canal to the contact of instruments, and of dilating it sufficiently for the passage of the body. According to circumstances, these necessary precautions demand very simple operations, as in the urethral canal, in which we need merely pass a set of sounds, or more severe ones, such as section of the sphincters, linear rectotomy, incision of wounds, etc. Moreover, whenever the operation threatens to be painful, we must give the patient the benefit of the use of anæsthetics, if circumstances permit.

I will say nothing, at present, with regard to the position given to the patient, because it varies in each particular case. Finally, a good light is always useful. As in the previous section, I will first examine the various methods of extraction in the natural passages, and then in wounds. This does not imply that the principles change, but the instruments differ slightly on account of the nature of the foreign bodies.

We must again take into consideration with regard to the natural passages, whether the canal has a single or double orifice. In view of the slighter importance of the latter variety, I will say at once that the measures are such which enable us to force the obstacle in the direction in which the normal contents of the canal move. This manipulation is almost exclusively employed for bodies lodged in the œsophagus, and bears the name of propulsion. It is very simple, and consists of pressure upon the body with the aid of a sponge or some other instrument.

Ordinary extraction, which is the most interesting, is performed by means of a large number of methods, which are classed in the following groups:

1. Methods of direct extraction—simple prehension.
2. Methods of indirect extraction—retropulsion.
3. Methods of extraction by prehension and duplicature.
4. Methods of extraction by section or fragmentation.

1. *Direct extraction. Simple prehension.*—By direct extraction I refer to the prehension of the body by any means whatsoever, if the instrument is not obliged to pass beyond the object. It is effected in many dif-

ferent ways, either by means of the hands alone or by the aid of special instruments.

The hands may suffice to withdraw bodies which have lodged in the pharynx, rectum, or vagina—in a word, wherever one or more fingers can penetrate. But their action is very limited, and most frequently we are compelled to resort to special instruments. The latter are generally forceps with two or more blades, straight or curved, broad or narrow, strong or weak, according to their purpose and the changes which are daily made by surgeons and instrument-makers. Their action is always the same; having been previously oiled, they are introduced closed, and only opened after they have been arrested by contact with the body. But, apart from this general type, there is an infinite variety of means for direct extraction, which are made use of on occasion in the absence of others, or when the nature of the object and organ permit it. Thus wooden foreign bodies in the rectum have been several times extirpated with the aid of an auger. If the body is hollow like a bottle, we may employ dilating forceps; if it has a neck, a slip-knot has been tied around this part, etc.

Moreover, and especially in the auditory canal, the body has been able to be fixed by means of glue to an object which was applied to it, and tractions are then made upon it. At another time a leech is employed to extract a pea from the ear.

In addition to these measures, which are more ingenious in conception than in practice, I will mention: the aspiration of a foreign body, which has proven successful in the trachea, and which has been often extolled in foreign bodies of the ear and bladder; the attraction of a magnet, which some authors have successfully employed for foreign bodies of the natural passages, etc. But all these measures are impracticable, and not capable of rendering real service.

2. *Indirect extraction—retropulsion.*—Although less broad than the preceding, this second class deserves none the less an especial attention. It consists in passing beyond the foreign body and in conveying it outwards by means of simple or complicated hooks which seize and conduct it. For this reason this class of instruments has been termed conductors. They are employed in a large number of cases; the most common ones are those which have reference to bodies lodged in the œsophagus, urethra, and rectum. There is an infinite variety of these conductors, from a simple hook with a handle of metallic or other wire, to movable baskets, parasol extractors, dilator extractors (water or air). We could easily count more than fifty for the œsophagus alone, and the inventive genius of surgeons has not been less fertile in regard to urethral instruments, etc.

It is evident that these methods of extraction are inferior to the first, because, in order to act, the instruments must pass by the body, a circumstance which is not always very easy, and especially, harmless.

3. *Extraction after duplicature.*—When the foreign body is found in a very large cavity, and when it is long and flexible, or capable of being bent without breaking, it is sometimes advantageous to employ this method. In order to realize this indication, which is very often met with in regard to the bladder, instruments called duplicators have been devised, which, after having seized the body crosswise, bend it, and thus carry it outside. In order that this plan should be applicable, it is necessary that the diameter of the body to be bent should not be too large, or it could not pass into the canal after it has been doubled. It is in

this manner that catheters, hair-pins, etc., are extracted from the bladder.

4. *Extraction by fragmentation, crushing.*—It is useless to explain the nature of this procedure; I shall confine myself to citing a few examples and stating the ends which it serves. In order to extract a foreign body by crushing, the body must be capable of being cut or crushed without producing fragments which will be dangerous to the parts. In addition, if we wish to apply it to fragile and dangerous bodies, like glass, we must previously protect the walls from the action of the pieces. Whenever this protection is impossible, the method must be renounced. It is for this reason that we do not break glass tubes in the bladder, while glasses and vials have been successfully extracted from the vagina or rectum, by breaking them. But sometimes crushers, lithoclasts, or other instruments have served to cut, break, or crush bodies in the bladder. In the rectum this method has been employed to break and crush stercoraceous tumors, aid also being derived from a current of water. Here also simple section has done good services in cutting or sawing twigs of wood and bodies imbedded in the walls and even in the bones. When it is applicable and harmless, this measure is excellent, because it greatly facilitates extraction, and frequently avoids serious devastations. Thanks to the laryngoscopic mirror, we can also employ it in the larynx and trachea. Thus a surgeon has succeeded in cutting a bone, the ends of which were imbedded in the folds of the mucous membrane of the glottis.

Extraction of foreign bodies from wounds.—The extraction of foreign bodies lodged in wounds is done in the same way as when arrested in the natural passages. If it has two orifices, we can also resort to propulsion, but its use is much more limited. We can extract fragments of clothes which have been entangled by the bullets, by introducing a sound into the track of the canal.

Direct extraction is employed daily. If a part of the body, a bristling point, a piece of the weapon, etc., projects outside, it will be of great service in exercising traction. If the wound is too narrow, and the body does not project, it must be incised or dilated according to circumstances. In order to exercise traction upon the bodies, we usually resort to forceps of various shapes, which unite strength and lightness. When the foreign body is fixed in a bone, it must first be rendered movable by traction, or, more frequently, by raising portions of the adjacent bone either with a gouge or with a trephine. In those cases in which there is a resisting surface, the turrel is also applied which screws into the metal, if it permits of penetration like lead.

As in the foreign bodies of the natural passages, we may also employ instruments which push the body from behind forwards; thus for centuries a large number of curettes for the extraction of bullets have been invented. I will confine myself to these general facts in order to avoid entering into details, which will find their place elsewhere.

II.—Extraction through Artificial Channels.

The operations necessary to discover and extract foreign bodies are very numerous, and they constitute a method of treatment whose indications are clearly laid down. Whenever a foreign body, which is not expelled or eliminated by the unaided forces of nature, and which is beyond

the resources of art, produces threatening symptoms, the indication arises for its extraction through an artificial channel. But it is also necessary that the operation be possible, and that it is not equally dangerous with the further stay of the body.

a. Almost all the mucous canals have been the site of operations of this nature; their gravity is much greater when the latter are deeper and in the vicinity of important organs. At the two extremes of this series we find "button-holing" of the urethral canal and enterotomy. Each operation has its own name, and among them I will mention œsophagotomy, tracheotomy, gastrostomy, perineal and vaginal section, etc. Some are recent, such as opening into the œsophagus and stomach, while cystotomy has been performed in such cases for a long time. It would be impossible in a general work to give the indications for each of these operations, and they will find a much more fitting place at the close of each section. However, they are all governed by the same rules, and form an exceptional method, a last resort when the others fail, or when they would prove injurious. In the œsophagus, for example, the operation is only performed if the body is situated in the cervical region, if the attempts at extraction and propulsion have proven useless; or if, on account of the shape and irregularity of the body, it is probable that extraction will lead to serious disturbances. In this canal, whose importance is considerable, the indications are very decided, because it is necessary to act early. In the stomach, on the contrary, the presence of the body does not immediately threaten life, and, in operations, the surgeon may await the indications arising from the protrusion of the body, the appearance of symptoms, etc. This is equally true of enterotomy, which, more than the others, is regarded at the present time as a last resort in the gravest cases, or when there are certain complications.

If a foreign body in the bladder is rigid, inflexible, and either naturally irregular, or has become so from a deposit of calculous matter upon its surface, none of the ordinary measures of treatment will be applicable to it, especially if the affected bladder does not well tolerate the attempts at lithotrity. In such a case the body must be reached through an artificial channel, and this is done by means of the various operations of cystotomy. What is true of the bladder in the male is also true in the female, though to a less extent, on account of the dilatability of the urethra in the latter.

When the canal is superficial, the chances of success increase, the operation becomes more simple, and is less looked upon as a last resource. Extraction by a wide incision, or by puncture of the urethra is not much more dangerous than simple extraction, and it is a necessary operation in cases of pointed, irregular bodies, and of difficult extraction; according to circumstances it includes several ingenious devices, each of which has precise indications.

Finally, among the operations in this class, that of tracheotomy is undoubtedly the one for which the indications occur most often and early. This is due to the fact that we either relieve threatening symptoms of asphyxia, or that we endeavor to determine the situation of a body whose dislodgment we dread, or, finally, that we wish to extract the foreign body. The results which it gives are very satisfactory, its dangers compared to its benefits are small, and for these reasons it has formed one of the principal means of treatment for bodies in the air-passages.

b. The analogy between the natural passages and wounds also exists with regard to the artificial channels, but the indications are slightly dif-

ferent. By means of counter-openings, properly made, we can very frequently withdraw foreign bodies from wounds. If the point of a broken needle projects under the skin, nothing is easier than to cut through the latter and seize the foreign body. But counter-openings are useful even in bodies like bullets, which are larger and deeper, when the body is situated deep at the bottom of a long, narrow, sinuous track, extraction through which would be inconvenient or dangerous, and through which the discharge of secreted matters occurs with great difficulty. In this case the site of the counter-opening is determined by the nearest point, attention being paid to a certain extent to the sweep of the new wound, which should favor the natural escape of the pus.

Some special circumstances, which depend upon the situation occupied by the projectile or fire-arm, may indicate to the surgeon the abnormal position in which the counter-opening must be made. Such are, for example, the incisions at the postero-inferior part of the thorax in order to extract bullets from the pleural cavity, and trephining, which is often performed very far from the aperture of entrance of the projectile.

Treatment of objects applied to the surface of bodies.—When bodies are fixed around the penis or fingers, whether metallic or not, the indication always remains the same; we must remove the cause as speedily as possible. For this purpose we may resort to mild or to active measures. Among the first (and though of easy application and harmless, they are very often ineffectual) are included the thread device for rings, elastic compression, and solution of gold or silver rings by rubbing them with mercury. In the second category are placed really effective measures, such as section of rings, collars, etc., either by sawing, filing, or breaking them. But amputation should never be performed save under exceptional circumstances, and it is better to trust to nature than to cut off a useful and indispensable member without sufficient reason.

PART II.—FOREIGN BODIES IN THE INTESTINAL TRACT.

PHARYNX AND ŒSOPHAGUS.—STOMACH.—INTESTINES.—RECTUM.

GENERAL ETIOLOGY.

As the majority of bodies which are abnormally present in the intestinal canal enter by the mouth and pharynx, it is natural to collect in a general chapter all that refers to their etiology. In the midst of the infinite variety of causes which exercise a greater or less influence upon the production of this class of accidents, it is very difficult to establish classes and to group observations, either because their origin is obscure, or because they are due to multiple influences. Nevertheless I believe that the best way of looking at the question is to range in one group all the bodies which are derived from alimentation, and, in a second, all those which are abnormally introduced into the digestive canal, either through perversion of ideas, imprudence, boasting, malice, etc., etc.

I. Causes of Alimentary Origin.

Two factors play the chief rôle in the production of foreign bodies in the intestinal tract of alimentary origin; these are: the digestive tube, on the one hand, and the food, on the other. Whenever the equilibrium which exists between them becomes compromised, the arrest of the food takes place. If the canal is healthy, it is usually necessary that the food present some peculiarity or some imperfection, which predisposes to its retention, and modifies the regularity of the function. In like manner, if the food is found under ordinary conditions, the digestive tube, by some organic or functional change, must have favored the arrest, and produced the symptoms.

It would be very difficult to say what part should be attributed to each of these two elements, and we cannot compare these two sources, both of which give rise to an infinite number of cases.

Almost all intestinal affections predispose more or less to the arrest of foreign bodies, whether they are congenital or acquired, inflammatory or neoplastic, functional, nervous, or organic. But there are some which predispose more than others, and which arrive at the same end by different means. If we follow the natural path of the food, we will experience no difficulty in encountering numerous examples. Every one knows the

difficulty which the loss of the teeth produces in the division and mastication of the food; and from this fact alone the old man is more exposed to its arrest in the pharynx or œsophagus than another person. Here the organic alteration produces a serious functional disorder, and the food, being out of proportion to the narrower parts of the digestive tube, is more easily arrested. If we recall the complex mechanism of deglutition, and the very great disturbance which the slightest inflammatory or other affection of the pharynx produces, we will not be surprised to find that alimentary substances go astray or are arrested in the isthmus of the fauces. But the pathological changes in the œsophagus are even much more important; there are none which do not act with the greatest energy upon its functions—from a simple ulceration, or wound, to neoplastic or cicatricial strictures. Here, again, the nervous element sometimes intervenes, producing either severe spasms or paralyses, usually of exanthematic origin, which almost inevitably produce arrest of the alimentary bolus.

If the stomach is very often the site of the abnormal presence of alimentary masses, it is not because the very regular cavity of the viscus predisposes thereto; but this fact is due to the condition of the narrow orifices which give entrance to it, and the pylorus presents an obstacle to the expulsion of food much more frequently than the cardia. Witness the cancers of the pylorus, which very soon alter the organ to such an extent that no food can pass it, and inanition is the result.

By its nature, the small intestine is less predisposed to the arrest of food; but, on account of its mobility, it may assume vicious positions, which result in obstructions. If it is paralyzed, the solid matters come to a stand-still more readily, and accumulate at one point, in the majority of cases, in the cæcum or colon. Finally, the natural or accidental diverticula and external compression also play a part in the production of an arrest of the substances, and, consequently, predispose to foreign bodies.

This rapid enumeration will suffice to show the reader the importance of this factor, viz., the digestive tube. But many other affections, which I have not mentioned here, produce the same effects. Upon the other hand, the food gives rise to very interesting considerations. And first, according as we regard the question with reference to this or that point of the digestive tract, we will not fail to perceive that the causes which arrest it in some, differ from those which produce its detention in others. Thus, in the first part of the digestive tube, it is the volume of the alimentary bolus which prevents its advance, while in the lower parts it is rather its insolubility in the intestinal fluids which favor its arrest. An example will render this idea more striking; if a large piece of meat is arrested in the œsophagus, its volume will hold it there, and when, by means of surgical interference, this body has been pushed into the stomach, all danger is passed, and its slow but certain transformation into chyme renders it innocuous in the intestines. On the contrary, the small seeds of the strawberry, grape seeds, and the pits of certain fruits which readily pass through the first portions of the intestinal tract, are very often arrested in the intestines, where they remain unaffected and very liable to lodge, by becoming agglutinated in the diverticula and appendices.

Nevertheless, in reviewing the history of the bodies which have been found in the various portions of the digestive tube, the frequency of foreign bodies of alimentary origin which have been arrested in the first

portions is very evident, and more than three-fourths of them have become lodged in the pharynx and œsophagus. In order that a body of alimentary origin may be arrested in the pharynx or œsophagus, it must be large (meat, vegetable, or fruit), and it is then introduced involuntarily, during mastication, by the gluttony of persons who eat with avidity. Sometimes, after vain efforts at dividing pieces of tough meat, they are swallowed whole, and arrested in the œsophagus, etc. This want of proportion between the dimensions of the alimentary bolus and the digestive canal, is also observed in children, in whom the œsophagus is far from attaining the proportions which it reaches at a later period. But imperfection in the food which is poorly prepared and cooked, especially becomes the source of accidents. In a general way, all meats which do not require efforts of mastication in order to be swallowed, and which enter the pharynx with the greatest ease, are more dangerous, from this point of view, than the others. Thus pieces of bone are found in soup and vegetables, bones in the meat of fish, and various foreign bodies in drinks (glass, wax, leeches, etc.).

Prior to 1830, the period at which Bégin wrote his treatise upon foreign bodies in the œsophagus and œsophagotomy, examples of ingested foreign bodies were relatively very frequent in the army, and attention had, for a long time, been attracted to this point by regimental surgeons. Almost all the accidents were due to the arrest of pieces of bone in the œsophagus, and upon endeavoring to explain the causes of this singular accident, it was soon found to be attributable to imperfect food. In fact, in the making of soup, the bones were broken with heavy objects, and the pieces passed with the fluid into a common mess. It was not astonishing, therefore, that the soldiers should have swallowed some of these pieces, and so much the more, as, in order to obtain their share, they were compelled to manifest great haste and avidity. The writings of the physicians of this period all advise the general application of three indispensable rules, viz., to saw the bones instead of breaking them, to strain the bouillon instead of turning it directly into a common vessel, and, finally, to give each man his own mess in order to avoid gluttony. Thanks to the adoption of these wise measures, accidents of this kind have, in great part, disappeared, and to-day we do not meet with more cases of foreign bodies in military than in civil life.

These facts show what a great influence imperfection in cooking possesses. Certain vegetables, like cabbage, very often conceal pieces of the bones of mutton, game, or poultry, which then become arrested in the œsophagus. But of all articles of food, fish predisposes, more than all others, to these accidents, because the numerous bones found in their flesh are often introduced into the buccal cavity, despite all precautions, and it may happen that the instinctive, but very curious separating work of the tongue does not suffice to completely free the alimentary bolus. They are then swallowed with it, and may either be arrested or meet with no obstacle. It is not extremely rare to find that they traverse with impunity the entire length of the digestive tube, and only become a source of accident at the lower end of the rectum.

The bad habit which certain persons, and especially children, have of swallowing fruit pits, has often been followed by disastrous results. These include, among others, the stones of peaches, apricots, and prunes, which are dangerous on account of their size, in all parts of the canal; the pits of cherries and plums, which, by their accumulation, may become the origin of stercoraceous masses, which insinuate themselves into the vermi-

form appendix. But aside from these bodies which are swallowed voluntarily, there are a large number of smaller objects, which are ingested with the alimentary bolus, and usually rejected together with other matters incapable of digestion, but which, under rare circumstances, have become the point of departure of grave symptoms. Among these I may mention the seeds of apples, pears, melons, grapes, oranges, strawberries, mulberries, etc. Some beans with thick perisperm act in the same manner. It is evident that their introduction is entirely unknown, and that the conditions favorable to their arrest in certain parts of the intestinal tract play a chief part in these cases. Not only fruit stones are swallowed, but even fruit containing the stones, and whole cherries, or quarters of oranges, have often been the cause of accidents. In a case reported by Maisonneuve, a cherry had caused strangulation of a hernia, and I have seen an individual extremely frightened by the expulsion of a very large body, which was composed of nothing else than whole quarters of oranges, which had been swallowed a long time previously, and had not been digested.

Certain foods also predispose, by their nature and composition, to the formation of foreign masses and stercoraceous stones. Thus, the oatmeal, which enters into the diet of certain nations (Scotland, Ireland, and England), predisposes especially to the formation of stercoraceous tumors, and the great richness of the chyle, in phosphates, favors the agglutination of the husks which occur in the bread. But this source of concretions, which is so important in animals, especially the horse, is very restricted in man.

By the side of the solid or semi-solid foods, we must place the foreign bodies which are introduced into the digestive tube in various drinks. We do not here refer to bodies which are accidentally found in wine, water, etc., but of those which sometimes occur under identical conditions. Thus pieces of cork, sealing-wax, etc., have been arrested in the pharynx and œsophagus, but the interest of the question is almost exclusively centred in the ingestion of leeches with water, an accident which is not very rare in warm countries (Italy, Africa, Spain) in which the waters contain these animals. The literature of military surgery contains numerous examples of this class of accidents, which are due to a species of filiform leech, bearing the name of Hémopis Vorax, and which, on account of its small dimensions, is very frequently unnoticed in the water. Moreover, there are soldiers who are more especially the victims of this class of accidents, as when, after fatiguing marches under a hot sun, the men, in order to relieve their thirst, throw themselves upon the ground to drink, the water being brackish and obtained from small puddles. The leech which has been swallowed with the water becomes fixed in the pharynx or œsophagus, and there becomes the source of curious, and sometimes serious accidents. Every year the journals record some fresh example of the arrest of a leech in the primæ viæ. But these accidents have become much less frequent in the army, thanks to the introduction of cups, which enable the soldier to see what he is drinking, to a certain extent, and thanks to the hygienic measures from which the chiefs of expeditions, at the recommendation of physicians, never depart.

II. Foreign Bodies of Non-Alimentary Origin.

The causes foreign to alimentation are very numerous, but the principal ones are included in the following category:

1. Instinct.
2. Perverted ideas.
3. Vicious habits.
4. Voluntary introduction.
5. Imprudence.
6. Malice.
7. Accidental origin.
8. Surgical origin.

The instinct which leads young infants to carry to the mouth everything that they find is so well known as to render it unnecessary to insist upon this fact, and it is very frequently the starting-point of accidents. This enables us to explain how the strangest articles may be found in the digestive canal—the foot of a chair, for example. A short time ago, the journals mentioned a very strange accident occurring in a child who had swallowed a hair.

Observation.—A child, less than a year old, had suffered for several weeks from frequently repeated convulsions, without any other apparent change of health. All the usual remedies had been employed, when the mother accidentally noticed the end of a hair lodged between the two incisors. Upon pulling upon it, the mother observed a hair nearly ninety centimetres long hanging in the infant's fauces. As soon as the hair was removed, the convulsions ceased as if by magic. (Journal des Sciences Méd. de Louvain, 1878.)

In old persons who have arrived at second childhood, this instinct sometimes reappears, and may be attended with very serious consequences. Thus old people have been known to swallow plaster, dirt, etc., which they have mistaken for food.

In adults, *perversion of ideas* is one of the most frequent causes, and is manifested in a thousand different ways. Sometimes a foolish fellow introduces a large number of bodies into his stomach without any known object; sometimes a maniac, in order to lay violent hands on himself, swallows large bodies like knives, forks, eye-glasses, etc.; finally, delirious patients swallow the most varied articles in their unconscious and disordered movements.

Observation.—Sonderland, of Barmen, has observed a remarkable case in which two iron forks were swallowed during the delirium of typhoid fever, and made their exit by means of suppuration through the abdomen, in a girl twenty-two years of age. (Neue Jahrbücher der deutschen Medizin und Chirurgie, 1823.)

To this group, in which the moral irresponsibility is absolute, we must also add those cases which are due to *drunkenness*, and these are not the least numerous, because during the period of primary excitement, the over-excited individuals perform the most unreasonable acts, and enter into the most curious wagers. The number of drunken individuals who have swallowed foreign bodies can be counted by hundreds. Hévin reports, among other curiosities, that the Royal Guards, after an orgie in which they had drunk a great deal, broke their glasses and swallowed the pieces, thereby causing death.

A large number of cases collected in lunatic asylums have been the consequence of a suicidal mania in individuals destitute of reason, for men who are sound in mind rarely make attempts of this kind in order to put an end to life. Nevertheless, facts occur which prove that these attempts usually fail. An individual has been known to swallow a gold spoon without succeeding in his suicidal attempt; another author reports the history of a man, who, in his attempt to commit suicide, swallowed seven pieces of wood four and a-half inches long, without killing himself. He then hung himself, and these enormous fragments were found in his stomach.

In reading the observations of authors relative to bodies lodged in the digestive canal of the insane, we are even surprised at the exceptional tolerance of their intestinal tract, which often becomes a rendezvous for the strangest articles. In order to form an idea, it will suffice to recall the game of dominoes which was swallowed by a lunatic under Foville's observation, and the histories of swallowed forks, legs of pots, pieces of wood and iron, etc., which abound in the journals. Their number is very often considerable, as in the lunatic observed in an English asylum, in whose stomach were found more than 1,000 shoe-nails among the 1,841 objects which it contained! The slight amount of confidence given to the statements of an insane patient often causes accidents of this kind to be overlooked, and it is only on autopsy that the truth of their assertions, which were entirely disproportioned to their general condition, has been recognized.

Observation.—Chopart relates that the poet Gilbert, having become insane, was treated for this affection at the Hotel Dieu, in Paris. On account of his mental condition, no attention was paid to his statement, that he had introduced the key of his room into his fauces. He died shortly afterwards, and the key was found in his œsophagus, the ring situated below and the bit pressing upon the arytenoid cartilages, the soft parts of which were inflamed and ulcerated. (Chopart: Traité des Voies uriaires, T. 2, p. 131.)

It is very curious to remark, among the causes of foreign bodies in the digestive canals, the mania which certain persons, who are otherwise healthy in intellect, have of daily eating the same non-alimentary bodies and of chewing something.

This category undoubtedly includes much fewer examples than the others, but they are remarkable for their analogy. In one case, for example, an individual had, for sixteen years, been continually swallowing cacao-bark, and died in consequence. Furthermore, in the stomach of one young girl were found twine and ten pounds of hair twisted together. To these examples I could easily add others, referring to nails, needles, etc.

In truth, individuals who are victims of these vicious habits act under the impulse of an unconscious mania; but a large class of objects are introduced voluntarily for the most curious reasons. I will first mention those individuals who make a profession of swallowing the most indigestible articles in order to turn the curiosity of people to their profit. These include the swallowers of knives, sabres, etc., the stone-eaters who, for a small sum of money, go daily to the market-places and haunt public squares in order to exhibit their skill in swallowing pebbles, nails, and glass.

The history of some of these peculiar acrobats has been preserved, and I do not know how to give a more exact idea regarding them than by re-

producing an observation concerning the miserable end of one of them. It shows how great the tolerance of the digestive canal may become through habit, since for forty years this unfortunate individual had continued in his calling of wandering acrobat, and had lived at the expense of the elasticity of his organs.

Observation.—Henrion, called Cassandra, born in Metz, in 1761. Not satisfied with the various trades which he followed in his youth, he began to force himself, at the age of 22 years, to swallow pebbles. Sometimes he swallowed them whole and without any preparation, and sometimes he broke them between his teeth, after having first heated them red-hot and then suddenly plunged them into cold water. In this manner he palmed himself off as an American savage. For several years he had fixed his residence at Nancy, and there continued the same habits which he had not interrupted, swallowing daily a large number of pebbles, sometimes as many as thirty or forty. The largest pebbles equalled in volume a large nut, but they were usually smaller, and Henrion demonstrated their presence in the stomach by the collision which he obtained upon percussing the epigastric region. With the aid of salts, he passed them in twenty-four hours, and often made them do duty for the next day. He also swallowed living mice, though only one in the course of aday, as well as crabs of moderate size, after their claws had been cut. When the mice were introduced into the mouth, they threw themselves into the pharynx, in which they were soon suffocated, and their deglutition was then facilitated by that of a nail. Upon the following day it was passed from the rectum, flayed, and covered with a mucous substance. At another time, three large pennies were successively put to the same use, and Henrion found them later, scraped clean and mixed with fæcal matters.

He continued this calling until 1820. At this time he swallowed some nails, and then a plated iron spoon measuring five and a half inches in length and one in breadth, for a moderate sum. He died seven days later. The autopsy of this curious acrobat will be detailed later. (Arch. Gén. de Méd., 3e Série, 1839, p. 353.)

Some of these acrobats have had a very great reputation, and I will mention the example of the famous Sichard who, according to Hévin, swallowed forks, razors, and nails, without accident, in the presence of Charles I., King of England. How many times have large pieces of money, such as six-livre coins, or five-franc pieces, been swallowed on a wager! But, as we shall find with regard to foreign bodies in the œsophagus, these unfortunates are often punished by a temporary harmlessness. Certain individuals, in order to excite the curiosity of the spectators, sometimes introduce very long bodies (opened knives, blades) into the œsophagus, retain them by closing the jaws, and then cautiously withdraw them. It has unfortunately happened that some of them have let go their hold while endeavoring to speak, and the swallowed objects have become the source of serious accidents.

We also find in literature quite a considerable number of cases in which pieces of gold or silver money were swallowed by persons who resorted to this extreme measure in order to protect their money from robbers, or by robbers who endeavored to rapidly hide their booty. As many as a hundred louis-d'or have been thus introduced into the digestive canal. Hévin reports, among other curious examples, the case of a physician, who, having been made a prisoner by the pirates of Barbary, could only keep his small stock of money, which was threatened by the corsairs, by resorting to this stratagem.

Furthermore, a soldier swallowed a small teaspoon, which he had stolen, in order to evade a search and divert the suspicion which rested upon him. It was successfully removed by gastrotomy a short time afterwards.

Finally, foreign bodies are sometimes swallowed through devotion and

fidelity. I refer to dispatches which messengers may carry and a knowledge of which may compromise several persons, a camp or an army. It was the rule to enclose, in tin-foil, dispatches, which were bent and rolled like bullets, and to command the messengers, in case they could not break through the enemies' lines, to swallow them sooner than let them fall into their hands. The danger being avoided or passed, they were often compelled to seek advice from physicians in order to hasten the expulsion of the precious foreign body. Some of these have an historic interest.[1]

Of all the causes noted as the origin of foreign bodies in the digestive tract, *imprudence* is one of the most frequent. Sometimes it is inattention and ignorance which play the principal part, as in the case of a nurse who gave a child a comfit to suck; the child swallowed the sweetmeat, which entered the œsophagus and produced asphyxial symptoms. Sometimes substances which are imprudently left in the mouth during sleep fall into the pharynx and are swallowed. Witness the history of a young man, reported by Hévin, who, having placed a gold ducat in his mouth to relieve a dental neuralgia, swallowed the coin during sleep. Furthermore, a man fell asleep having between his teeth a pen-knife the blade of which, 0.03 in length, was open; this he swallowed and passed per anus three days later.[2]

How often have pins and needles, carelessly placed between the lips, penetrated into the digestive tract! What is true of these objects, is not less so of a large number of others which are less common, but more curious. Anthoniesz[3] has reported the history of a fisherman who caught a fish four and a half inches long and a half inch wide. He carelessly placed it in his mouth while he baited his hook. By a sudden movement the fish jumped into the pharynx and entered the œsophagus, where it remained fixed by its fins. The unfortunate patient only recovered after the performance of œsophagotomy.

Two other analogous accidents occurring with the same fish under similar circumstances have drawn attention to a curious animal, the *anabas*

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[1] Napoleon gives the history of a case of this kind: "When I commanded at the siege of Mantoue, shortly before the surrender of this fortress, a German was arrested while endeavoring to enter the city. The soldiers, who suspected him of being a spy, searched him without success; they then threatened him in their own language, which he did not understand. Finally a Frenchman was called who spoke German slightly, and who threatened him, in bad German, with instant death if he did not at once disclose all that he knew. He accompanied this threat with furious gestures, drew his sword, placed the point of it upon his belly, and said that he was going to slit him open. The poor German, frightened, and not understanding the jargon of the French soldier, imagined, when he saw him threatening his belly, that his secret was disclosed, and cried out that it was unnecessary to slit him open, and that if he waited a few hours it could be obtained in the natural manner. This gave rise to fresh questions; he stated that he was the bearer of dispatches for Wurmser, and that he had swallowed them as soon as he found himself in danger of being captured. He was carried to my headquarters, whither several physicians were summoned. It was proposed to administer a purgative, but they stated that it was best to await the operation of nature. He was then confined to a room under the surveillance of two staff officers, one of whom was constantly near him. After several hours the expected object was found. It was enclosed in wax, and was as large as a nut. When opened it was found to be a dispatch written in the hand of the Emperor Francis, and which requested him not to be discouraged and to hold out a few days longer, when he would aid him with a strong column." Napoleon, upon these indications, left with his troops and completely defeated Alvinzi at the passage of the Pô. (Mémorial de Sainte Hélène, T. II., p. 468.)

[2] Dancel: Journal de Méd. et de Chir. Prat., 1864.

[3] The Lancet, 1854.

scandens of the Ganges, and which possesses the curious faculty of jumping, owing to the peculiar arrangement of its fins. In one of these cases the fish was pushed into the stomach, after six hours of suffering (Stewart).

After these cases of foreign origin, we may refer to that of the waiter in a café who, upon opening a bottle of champagne with his teeth, swallowed the cork, which was thrown violently into the pharynx by the discharge of gas. It would require volumes to record all the curiosities of this kind, which are little known and scattered through the annals of science. These few examples will enable us to form an idea of them.

Malice has been only too often the cause of the most serious accidents. Thus Hévin reports that the malefactors introduced by force a fork covered with cloth into the mouth of an unfortunate whom they were plundering, without doubt in order to insure silence. At other times hard, dangerous, or sharp bodies have been forced into the pharynx of individuals, especially children, with homicidal intent. The records of the courts contain more than one occurrence of this character, and of which I will cite the following:

A step-mother, desiring to rid herself of a little daughter, made her swallow, at different times, a certain number of needles. After long suffering these needles made their exit from different parts of the body of the child, and especially from her arms.

Under the head of *accidental causes* we must include a large number of cases, which are not the result of an intentional act and which occur unexpectedly. As an example, I will mention that of a child who, upon being suddenly frightened, swallowed a sou which he had in his mouth. Sometimes individuals swallow foreign bodies while playing. I have seen a young soldier who swallowed an onion larger than a walnut. This unfortunate, who was on guard at the Bicêtre, was amusing himself with his comrades who were throwing the onion by turns in order to catch it in the mouth. He was the victim of his own skill, for the onion became engaged so deep in the œsophagus as to produce symptoms of asphyxia, which only disappeared after the onion had been cut, crushed, and pushed into the stomach. This case has a great deal of analogy with the following history reported by Hévin concerning a poor singer; as he had opened his mouth to the widest and exerted all the resources of his throat, a practical joker threw a chestnut in such a manner that it fell into his mouth and œsophagus, where it remained fixed and became the origin of severe symptoms.

A large number of bodies have accidentally entered the intestinal tract during sleep, and animals especially are introduced in this manner. Now it is a mouse which has entered the open mouth and pharynx of a child asleep in the cottage of a wood-cutter, again a viper enters the stomach of a sleeping man, and does not produce any symptoms (Marndt)!

Can we reasonably accept and credit the fantastic accounts of living frogs, adders, and eels, which are introduced in the same manner! I think that we must exclude the poorly related accounts of older authors and confine ourselves to more recent ones. However this may be, accidental causes exercise a real influence upon the presence of foreign bodies in the air-passages, but they are then usually single.

I will close this long exposition by a few considerations upon causes of a therapeutic or surgical origin. These are not the least interesting, and dental plates, the use of which is daily becoming more extended, fur-

nish a considerable contingent of accidents, which are almost always serious on account of the irregularity and roughness of these bodies.

It is very curious to note the accidents occurring in persons who endeavor to vomit or to clean the tongue by introducing a long and flat object deep in the pharynx. Among the fifteen or twenty cases of swallowed forks which are reported in literature, more than one has been produced under such circumstances. Frequently in endeavoring to extract a foreign body which had been swallowed, the patients made use of forks or spoons which they also swallowed, so that the first accident became the occasion of a second and sometimes much more serious one. Thus an individual uses a fork in order to extract a bone which had lodged in his pharynx; he lets go of the instrument, which falls into the pharynx and disappears. Or, again, a man who was cleaning his tongue with a fork, lets it go and swallows it.

Very frequent also are those accidents which are due to the fall of pieces of sets of teeth, of entire sets which have been worn out, or of obturators of the vault of the palate, the latter being naturally rarer. This accident usually occurs at night in careless persons, who have not taken the precaution to remove their plates. It is a curious fact that some persons do not become immediately aware of the disappearance of their apparatus, and all the symptoms are slight. But those are exceptional cases, for it has often been necessary to resort to œsophagotomy in order to remedy serious and sometimes fatal disorders produced by the presence of the foreign body.

Surgical operations may be the cause of accidents of this character in some cases. I will pass by in silence the deglutition of teeth after their extraction, because it is not dangerous, but this is not true of sounds or other instruments which may be broken during operations.

Forestus reports that a barber, while examining the fauces of a woman, let an iron sound drop into her œsophagus, from which he was unable to extract it. It fell into the stomach, produced serious symptoms, emaciation, marasmus, and finally death at the end of two years.

Jackson[1] mentions a case in which an œsophageal sound was swallowed by a patient, and passed next day. But if an accident of this kind occurs, we cannot always count upon such a happy termination.

Finally, Simon states that he has seen pieces of sponge, which were detached from an œsophageal sound, produce symptoms of obstruction and compression followed by dyspepsia.[2]

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[1] Boston Journal, Jan. 1, 1874.

[2] Thèse de Strasbourg, 1858.

FOREIGN BODIES OF THE PHARYNX AND ŒSOPHAGUS.

CHAPTER I.

GENERAL CONSIDERATIONS.

It is natural to unite foreign bodies of the pharynx and œsophagus in the same study, because they present great analogies with regard to origin, symptoms, course, and therapeutic measures. As the general etiology has been sufficiently discussed in the preceding chapter, I will confine myself to an enumeration of the local lesions which predispose to the arrest of foreign bodies.

Influence of the Anatomical Arrangement, and of Lesions of the Pharynx and Œsophagus.

Upon close study of the construction of the first portion of the digestive tube, we will not fail to perceive that it is predisposed to the arrest of foreign bodies. This musculo-membranous canal, formed of two cones in apposition at their summits, presents normal constrictions in three places: 1st, at the level of the cricoid cartilage; 2d, at the level of the first rib; 3d, at the level of the diaphragmatic orifice. These constrictions exercise so great an influence that they form the place of election for the bodies. If we push this study a little farther, we will find that each of these points does not predispose to the arrest in the same manner. Thus the cricoid narrowing is especially unfavorable to the passage of large, rounded bodies, while it presents no obstacle to oblong bodies.

In order to render this fact more striking, I will state that a fork can pass more readily through the cricoid region than a fruit-stone or small-sized fruit; and this fact is easily understood, because transverse dilatation is alone possible, while the antero-posterior separation is very limited. The differences are less marked at the other points.

The predisposing pathological causes possess a real importance, which the practitioner should not disregard. In an inaugural dissertation, Simon enumerated all the affections which may exert a serious influence, and the tables which he formed are complete in almost every particular.

The changes in the region will result in the production of accidental or pathological obstacles which have their origin:

1. In the mouth and pharynx.
2. Outside of the œsophagus (abscesses, adenitis, tumors).
3. In the walls of the canal (abscesses, degenerations, constrictions).
4. In the interior of the canal (polypi, vacuoles, diverticula).

1. Affections of the Mouth and Pharynx.—It is a well-known fact that changes in the mouth, and especially the loss of teeth in old men, produce serious disorders in digestion, on account of defective mastication. In like manner, facial paralysis produces very serious disorders in the functions of the soft parts, whence results a great imperfection of the alimentary bolus, and consequently a predisposition to the arrest of substances. I have already stated above that all affections of the pharynx, whether congenital, inflammatory, or neoplastic, produce a very rapid influence upon deglutition, and hinder the passage of food. In some cases of nervous spasm, of hysterical or rabietic origin, deglutition becomes even impossible. Nevertheless all these affections produce rather a difficulty of deglutition than a complete arrest of certain bodies.

2. Affections in the Vicinity.—All affections of the neck, which give rise to swelling, predispose to the arrest of foreign bodies in the œsophagus. The larynx is sometimes projected forwards by glandular masses, and in this case the direction of the alimentary canal is changed. Thus surgeons have more than once noticed the coincidence of goitre with a body in the œsophagus. Nevertheless there is reason to believe that this category of causes is more rare than certain surgeons would have us believe.

3. Affections of the Walls.—The latter remark applies equally to lesions of the walls, if we except constrictions, which, even when very slight, singularly favor the arrest of alimentary or other matters. In some cases, cartilaginous and osseous degeneration of the œsophagus has been observed.[1] Œsophageal paralyses, which are much less studied and understood, produce serious disturbances in the progression of substances. Wilson has observed a case of paralytic dysphagia.[2]

4. In the Interior of the Canal.—To the preceding causes we must add those which result in acute or chronic changes of the mucous membrane. We can readily understand how polypi or other tumors, which project into the interior of the œsophagus, alter its functions and reduce its dimensions to a marked extent. Obstruction has also been observed, and examples are found in French authors, and in German works (Moesetig, Billroth). In one of Moesetig's[3] patients the obstruction was produced by the pits of fruit, which had accumulated in a constricted œsophagus. This patient died of inanition. The condition of the other was not more enviable, since the catgut, introduced at the height of an arrested lemon-seed, produced a perforation of the mediastinum, which carried off the unfortunate patient twenty hours afterwards.

I will also mention the case reported by Billroth,[1] who performed œsophagotomy in a child in whom a metallic button was arrested by a stricture, caused by the ingestion of a solution of potash a year previously. The same author also states that a cherry-pit and a glass bead produced

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[1] Mondière: Arch. Gén. de Méd., T. III., 1833, Journal de Corvisart, T. LV.
[2] Recueil Périodique, T. V.
[3] Wien. méd. Press, 1865.

similar accidents under like conditions. One of the children, in whom the cause remained unknown, died of pleurisy, while the life of the other was saved by œsophagotomy. We can see from these numerous examples what an injurious effect affections of these parts exercise upon the arrest of foreign bodies.

CHAPTER II.

NATURE OF FOREIGN BODIES OF THE PHARYNX AND ŒSOPHAGUS.

Foreign bodies of the œsophagus are divided into animate and inanimate bodies; the latter, which are most numerous, are either organic or inorganic. I will not detail the infinite number of varieties which are accidentally found in the œsophagus, and shall confine myself to a review of their interesting properties from a surgical point of view.

Table of Foreign Bodies of the Pharynx and Œsophagus.

- **Foreign bodies.**
  - Animate bodies.
    - Leeches.
    - Fishes.
    - Salamanders.
    - Mice.
    - Eels.
    - Frogs.
  - Inanimate bodies.
    - Organic.
      - Bone.
      - Fish-bones.
      - Pieces of meat.
      - Fruits and kernels.
      - Pieces of wood and grain.
      - Lung, egg, cork, spindle.
      - Dominoes, violin-pegs.
      - Comfits.
      - Cake, flute-stopper, teeth.
    - Inorganic.
      - Pins, needles.
      - Coins, flat and round bodies (child's saucer, medals).
      - Set of teeth, or portions of one.
      - Knives, scissors, compass, razors, blades.
      - Forks, spoons, rings, buckles, buttons.
      - Pebbles, glass, vials; pieces of glass, stone, brick; thermometers.
      - Bullets, bars, pieces of pots, eye-glasses, butcher's hone, feathers, iron file, brass chains, lead seals, tubes and pipes, diamonds, table-roller.
      - Sucking-bottle, beads, sounds, plaster, padlocks, fish-hooks.

Animate bodies.—The history of this group is quite complete at the present day. The leech, which accidentally appears in the primæ viæ from the ingestion of water in warm countries, belongs to the species known as horse-leech, "hœmopis vorax." All the inhabitants of the

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[1] Archiv für klin. Chir., 1871.

shores of the Mediterranean, in olden as well as in recent times, recognized the possibility of such accidents, and periodical literature is rich in curiosities of this kind. Next to leeches come living fishes, which have been several times observed by foreign authors. I cannot recall a single case occurring in Europe of a living fish being arrested in the fauces, and some of the cases of foreign origin refer to a species of fish which affects the most peculiar habits. This fish, to which authors give the name "anabas scandens" and which lives in the Indies, can live both upon land and in the water. This kind of amphibious life thus permits it to change its abode, and, in order to facilitate its movements, nature has endowed it with a row of very sharp fins which are its only means of locomotion. It is this strange animal which is referred to in many observations, as jumping at one bound into the mouths of the fishermen, at the moment when the latter wish to kill it or to hold it between their teeth.

The presence of worms in this organ is not very unusual, and is much more readily understood than that of mice, eels, adders, snakes, salamanders, etc., examples of which are found in many of the older authors, and have been collected by Mignon.[1]

Inanimate bodies.—Organic bodies, the long list of which has been prepared, like the following in the order of frequency, belong, in great part to the foods, and have therefore been introduced involuntarily. Bone and fish-bones alone form a very considerable proportion of this class.

But in the importance and gravity of the symptoms they are inferior to the inorganic bodies, which are the most frequent. Some of them astonish us by their size and irregularity, and these are not the least frequent. Thus Adelman has collected seventeen cases in which forks were swallowed, and it would be easy to add others to this number. However, it is sufficient to glance over the table in order to form a sufficiently accurate idea of the infinite variety of these foreign bodies. I will abstain from giving figures, being satisfied with indicating their relative frequency. It will suffice to say that this study is based upon an analysis of more than a thousand cases of foreign bodies in the œsophagus. More than a third of them attract attention by some strange etiological or therapeutical peculiarity. We cannot make valuable statistics with such a large proportion of exceptions, and Adelman's tables are defective in this as well as in some other respects.

Form.—These bodies are regular or irregular. They constitute varieties which are very important, from a symptomatic, and especially from a therapeutic, point of view. Some of them, such as needles, pins, and fish-hooks, are arrested because one extremity becomes engaged in the mucous membrane. Others, such as perfectly regular fruits (apples, chestnuts, onions), are arrested on account of their size. We must also expect to find that the smallest bodies are the most irregular; however, all forms are represented, but flattened objects predominate. These include pieces of bone, coins, all kinds of plates, forks, spoons, etc.

If we do not find, as in the rectum, glasses, sticks, or large bottles, nevertheless the œsophageal series is very rich in large objects. Witness the twenty-three cases of forks, open knives, and keys, the volume of which is very large, compared to the dimensions of the canal. It has been truly said that the imagination of the individuals who introduce foreign bodies is not limited by the elasticity of the canals; in this part the

[1] Thèse de Paris, 1874.

limit is quickly attained, and there is, in this regard, a great difference between both ends of the digestive canal.

Consistence.—The objects found in the œsophagus present infinite varieties with regard to consistence. In general, many of them, such as tendons, pieces of meat, beef, lung, and lard, which are of alimentary origin, have a pulpy or semi-pulpy consistence. This produces results which are interesting to the surgeon, who must expect to find that bodies which are very compressible by the contractions of the œsophagus, uniformly fill the entire canal, arrest deglutition altogether (even that of fluids), and produce symptoms of compression. Fruits (apples, chestnuts, onions) act in this manner to a less degree. But affairs take a different turn if the body is irregular. If it presents irregularities, the spasmodic contraction of the canal will produce friction of the mucous membrane, and even perforation in some cases. Needles, bones, fish, and portions of teeth are arrested in this manner. Is it necessary to refer to the solubility, density, fragility, etc., of all these bodies? These are unimportant considerations, which would carry me beyond the limits of this work. All soluble bodies are, from this very fact, foreign bodies only temporarily (sugar, pills, salts, gum), because they are slowly dissolved by the saliva. The density and weight play a very trivial part, and are always of secondary consideration, as the density has very little effect in comparison with the energy of the œsophageal contractions. Nevertheless some authors attribute to it a part which it is very difficult to determine.

Fig. 1.—Specimens of irregular fragments of bone lodged in the œsophagus (natural size). (Museum of Val-de-Grâce.)

Number.—As a rule only one foreign body is present, and this is readily understood in view of the symptoms which the presence of a single obstacle produces. Nevertheless some individuals have been known to swallow several, either simultaneously or in succession. I will refer, as illustrations, to those unfortunate cases in which individuals have swallowed a second object while endeavoring to extract the first. Sometimes a large number of needles have been swallowed at the same time; but, as a rule, they produce accidents beyond the œsophagus, and are found in more distant parts of the intestines.

CHAPTER III.

SITUATION.—STABILITY.—MOBILITY.

VERY irregular bodies are often arrested in the pharynx; those which, like fish-bones, pins, and needles, present sharp points, are plunged into the mucous membrane, adhere to the walls and remain fixed in this position. This fact is so true that the majority of cases of this kind are relieved if we are able to push the body below the pharyngeal isthmus. The most frequent site of those whose larger size affords a point of support which resists the efforts of contraction and deglutition, is the posterior portion of the cricoid cartilage. Some descend further down to the base of the neck; others, finally, are only arrested at the cardiac orifice. In this position the bodies usually remain absolutely fixed, on account of the permanent contractions of the muscular coat, and the examples of movable bodies are rare exceptions which only refer to living animals. Thus leeches and worms have been known to travel along the whole length of the œsophagus. Wanderback has published an example of the migration of a leech.

Observation.—X., æt. 22 years, a soldier of the 16th Regiment of the line, a baker by occupation, came to consult Moya in Catalonia on July 16, 1811, with regard to a hematemesis which had lasted fifteen days. During the night of the 19th the patient felt something travelling from his stomach along the œsophagus, causing a distressing sensation, and becoming fixed on the left side of the pharynx, where it produced a tumor which interfered greatly with deglutition, and even with inspiration. The vomiting then gradually ceased, but red or black expectoration continued. On the evening of the 20th the body lodged in the pharynx disappeared without being noticed by the patient, but some time afterwards the vomiting recommenced with more intense pains than usual. Leeches and opium were resorted to, but the vomiting persisted. During the night of the 21st the patient, who had fallen asleep a little, was awakened by a sensation similar to that which he had experienced two nights previously. But when the object was arrested in the pharynx, instead of becoming fixed, as on the first occasion, it produced in this organ a strong contraction, which forced it into the fauces; the patient then inserted his fingers and withdrew a living leech, which did not appear to have undergone any change. The man then recollected that on the 30th of June he had several times drunk water from a brook. Rapid recovery. (Recueil de Mémoires de Médecine Militaire, 1re Série, T. 23, p. 292.)

Regular bodies are sometimes moved by efforts of deglutition or vomiting, but these cases are very rare, so that foreign bodies in the œsophagus are characterized by their immobility.

Not only are they held in place by the vigorous action of the constrictor muscles, but also by the imbedding of the rough points into the walls. Thus when an attempt is made to extract some of them, such as pieces of gold and parts of false sets of teeth, it has been found necessary to tear up the mucous membrane to a considerable distance, and this fact has often given rise to a series of very grave symptoms.

CHAPTER IV.

PRIMARY PHENOMENA AND SYMPTOMS.

UNDER the title of primary symptoms I classify all those which are the immediate consequences of the introduction of the bodies, and which are produced within the first few days.

Among the foreign bodies which are introduced into the œsophagus, and remain there for a variable length of time, some produce no symptoms and remain latent for a very long period. We might be inclined to believe that the very smallest act in this manner, but this is not so; very large and elongated bodies may give rise to grave symptoms in other parts of the intestines without having produced any special phenomena in the œsophagus. It is also very curious to notice that the largest bodies may pass very readily; it is true that the tolerance of the œsophagus becomes very great in certain individuals, to such an extent that the symptoms have only begun in the most remote portions of the intestinal tube. Babington [1] reports the case of a sailor who could swallow knives without any danger. He had already swallowed fourteen; he then introduced seventeen others, and did not die until two years afterwards. The single observation of Fournier, who found more than twenty-two objects in a man's stomach, suffices to show that the œsophagus possesses a very great tolerance in some cases.

Upon restricting this study to those bodies which are arrested and fixed at any point whatsoever in the œsophagus, we will, nevertheless, find that a goodly number of cases present no primary or immediate symptoms. However, these bodies lose their indolence after a given time, and manifest their presence by symptoms which are sometimes of extreme gravity. Almost all the cases of death from hemorrhage belong to this group. The individuals experienced no malaise after the introduction of the body; they no longer thought of the accident—losing even all remembrance of it, until the time at which the severe symptoms develop. Some examples will throw this fact more in relief.

Observation.—Bégin (Recueil de mémoire de médecine militaire, T. 20) reports that a corporal had swallowed a 6-franc piece, as he had frequently done in bravado. He experienced no inconvenience during the next few days, and thought no more of the coin, which had been lodged at the height of bifurcation of the bronchi, as was rendered evident at a later period. Upon the fourteenth day the man had an abundant hemorrhage, the blood being semi-fluid. Upon the following day he had a fresh one of four or five pounds, which resulted fatally. At the autopsy the coin was found on edge between two erosions which communicated with the aorta.

Observation.—A piece of gutta-percha remained in a man's œsophagus for more than six months, without its being suspected. But one day he suddenly had a fatal hemorrhage from the mouth, while eating. The foreign body had formed a pouch upon the sides of the œsophagus, and had ulcerated an important vessel. (Erichsen, Vol. I., p. 189: The Lancet.)

Pieces of bone and coins are especially liable to act in this manner. This tolerance of the tube for foreign bodies is evident in numerous ob-

[1] Ann. de littér. méd. étrangère, 1810.

servations, and if it does not exist from the beginning, it is very often established shortly afterward. Thus we find that individuals swallow, during sleep, objects placed in the mouth, are not inconvenienced thereby, wake up unconscious of the accident, and again fall asleep. It has even happened that a person dreams that he has swallowed something, and that his dream is found verified. Cock has reported an example of this primary tolerance.

Observation.—A man, æt. 33 years, swallowed, while asleep, a plate of false teeth, the body falling into the pharynx. The man awoke, feeling slightly uneasy, and then fell asleep again. At a later period it became necessary to perform œsophagotomy, in order to procure recovery. (Guy's Hospital Reports, 1868.)

Suffocation.—Suffocation is the most frequent symptom of foreign bodies in the pharynx and œsophagus, and usually begins suddenly. It is not more readily produced by large bodies than by small; for, even if the volume is an active cause, the irregularities of the small objects produce suffocation in another manner. While tendons of beef and pieces of lung suffocate by compression, pins, fish-bones, and irregular bodies, by penetrating into the tissues, produce spasm of all the organs. The pain is so acute at each spontaneous movement of the pharynx, that respiration becomes impeded. The asphyxia is sometimes so intense, that individuals, who are deprived of help, die in a few moments. Hévin reports that an individual, while eating, swallowed a large piece of meat, which lodged in the œsophagus. The man rose hastily from the table, and died, near by, from asphyxia. His astonished friends, not seeing him return, and thinking that he had gone out for another reason, found him dead.

In what manner is death produced? As soon as the foreign body is arrested in the œsophagus, the face becomes congested and puffed. Respiration is arrested almost completely, and there is, at the same time, a spasmodic contraction of all the muscles of the pharyngeal region and of the larynx—a contraction which is intended to produce a considerable expulsive effort.

Perhaps too great a part has been attributed to compression in the production of suffocation. Thus, at the level of the cricoid cartilage, which, as we know, is a place of election for swallowed bodies, the presence of an object does not produce suffocation by simple compression, since the air-passages have resisting walls at this point. We must especially take into consideration the incessant action of the muscles of the pharynx and œsophagus, and the extension of the spasmodic condition to the larynx. The spasm of the glottis is due to reflex irritation of the pneumogastric, and is much more frequently observed when the foreign body is situated in the upper part of the canal. It then gives rise to the same phenomena that are produced by violent efforts at vomiting. In the latter case there is suffocation, an arrest of circulation in the face and neck, and an enormous effort in which the glottis adds a spasmodic and irritative contraction to that necessary for each effort.

An individual who is thus asphyxiated, with puffed face, the eye staring, injected and protruding from the orbit, and frightened face, cannot remain quiet. He is a prey to terror and intense mental agitation. He walks up and down, leaves the table if he has been eating, and demands relief more by gesture than by speech. Maclean performed œsophagotomy upon a child who had swallowed a bone. The mother had noticed it, because *her child's face became black.* Though this epiphenomenon

does not reach such a high degree in all instances, nevertheless traces of it are present in all.

Spasms. Convulsions.—Although less frequent than suffocation, these two symptoms are still encountered very frequently in varying degrees. Spasmodic constriction of the pharynx and œsophagus has been directly observed by Dupuy,[1] whose finger was so tightly grasped by the contractions of the walls of this canal that he was hardly able to withdraw it. In order to overcome the spasm, he was compelled to perform venesection prolonged to faintness, and the foreign body was then easily extracted.

This spasm is due to the irritation of the mucous membrane, and also to the position of the foreign body, which is usually situated behind and below the cricoid cartilage. Here, also, Krishaber's ideas concerning the physiology of the œsophagus enable us to understand both the arrest and the spasm of the walls of the canal. The boundary between the two portions of the tube—whose action is inverse, the one endeavoring to expel the body, the other to cause it to descend—is poorly defined, and the body, which is acted upon by two inverse forces, remains immovable. The neutralization of these two forces produces the spasmodic condition referred to by authors.

Does one of the three usual sites of foreign bodies predispose to the production of spasms? This is a difficult question to solve, but spasmodic disorders have been very frequently observed when the body is situated in the lower part. In Pommier's case[2] involuntary and spasmodic peristaltic movements were present, while respiration was interfered with by a peripheral constriction which appeared to oppose the dilatation of the lungs. Some convulsive movements were also manifested in the limbs.

Reflex action will also produce convulsions which have sometimes followed the entrance of a foreign body. Hévin quotes from Fabrice de Hilden and Tastain several cases of convulsions which followed the introduction of foreign bodies. A young girl, observed by Goudinet d'Yrieix, having swallowed a fish-bone, had such strong convulsions that she broke between her teeth the glass from which she was drinking and swallowed the fragments.

Larrey[3] saw a fish-bone produce, in a soldier, tetanic symptoms with subsultus, which only disappeared under the influence of antispasmodics; the fish-bone was eliminated by suppuration.

Pain is a very variable symptom, and only exists primarily in two well-determined conditions: 1st, when the foreign body produces distention of the canal by its size; 2d, when it irritates the walls by its shape. Both these conditions may be present at the same time. In the majority of the other cases the pain is slight or is absent altogether. A considerable number of large bodies reach the stomach and intestines without having produced acute pains in the first part of the digestive tube. However, such an important part has been assigned to this symptom that it will be well to dwell upon it at greater length.

When pain is present, it assumes two different characters: it is either fixed and localized in a point which the patient recognizes, or it is diffuse and dull. This latter form is found when a large body has been arrested; the first when the object is relatively small, such as a coin, needle, a piece

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[1] Nouv. Bibliothèque Méd., T. III., p. 125.
[2] Recueil de Mém. de Méd. et de Chir. Militaires, T. 53.
[3] Campagne d'Egypte, p. 134.

of bone, especially when the bodies are irregular. There is also another difference between these two forms of pain. While the acute pain of irregular bodies increases with every movement, especially the movement which carries the head backwards, and with deglutition, the dull pain is, on the contrary, modified not at all or very little; at all events it increases but slightly. These variations are not unimportant with regard to diagnosis, not only in order to judge of the existence of the foreign body, but also in order to determine its situation. At the present time the pain is greatly insisted upon as an element of diagnosis, and I will study it later from this point of view. I will confine myself to the statement that it increases upon palpation, upon explorative manipulations when the body is situated above the superior thoracic ring, and upon the latter alone when it is situated below it.

Pain is sometimes the only appreciable symptom, as shown by the following case.

Observation.—Hofer reports that a shoemaker, while drunk, broke a glass with his teeth, and swallowed the pieces. He felt a very acute pain near the articulation of the left clavicle with the sternum. Despite all attempts at extraction and propulsion, the body which the man stated that he had swallowed could not be found. The pains increased to such an extent that the patient died with febrile symptoms. Pieces of glass were found in the stomach and a wound in the œsophagus.

Cough and Expectoration.—Cough is rarely absent, and this is readily understood, because it is due to the spasm of the glottis. In the beginning it is dry, hacking, suffocating, and shows the energy of the efforts of the organism to rid itself of the irritating body. These paroxysms of coughing are similar to those which are found in individuals who vomit on an empty stomach. The air, after the effort, forces open the orifice of the glottis and escapes with a noise and by starts. It then gives rise to expectoration of mucus, and of saliva very often streaked with blood, which is rejected with difficulty and without any relief. Spitting of blood, vomiting, and muco-sanguinolent expectoration are also observed at times. If there are merely streaks of blood in the midst of the mucus, we may attribute it to rupture of the mucous membrane, produced by the foreign body or by the manipulations of the surgeon. But if expectoration persists and is intermittent, if the blood is red, and the accident occurs in a warm country, we must think of the ingestion of leeches. M. Baizeau has made a resumé of all the symptoms of this affection in a special work. As a rule, a certain time elapses before the leeches produce the sanguinolent expectoration to which Vulpian had already drawn attention. He also insisted upon a peculiar sensation of suction which accompanies the hemorrhage, and upon the intermittent sanguinolent expectoration. The interval between the escape of the blood and the ingestion of the leech is never more than twenty-four hours.

The blood is either of a bright red or of a deeper color; a leech lodged in the pharynx usually escapes observation, and the patient does not really experience the sensation of a foreign body until the animal has assumed considerable dimensions. Then he may be able to feel its movements. The loss of blood, when it lasts several days, soon produces weakness and anæmia, and plunges the individual into a condition of grave marasmus.

Dysphagia is present as a rule when the arrested bodies present any considerable size, but it is not constant and is extremely variable in degree. Thus a number of observations have been reported in which persons have

continued their meal after having swallowed a foreign body. Others have been able to eat without difficulty after the disappearance of the first symptoms.

When dysphagia is present, it is subordinate to the size of the body and to its shape, becoming greater as the latter is larger and more irregular. It may attain an extreme limit, and persons have been known to die of inanition after this kind of accident. All cases of œsophagotomy present this symptom to a high degree, and, since the performance of this operation has become well established, cases of death from inanition have become rarer. However, the difficulty in deglutition does not always exist for food and drink. In many cases it is stated that fluid food could be swallowed, while those articles which were semi-solid or pasty were arrested. This is a ready and well-known means of determining the degree of the dysphagia, and which is early employed, because the first care of the individuals after the accident is to endeavor to drink.

Alteration of the Voice.—The voice does not preserve its normal timbre when the foreign body is arrested in the upper parts, and when it impedes or prevents, by compression, the emission of sounds. The most frequent modification consists of harshness of the voice. The unfortunates who have swallowed some large body pronounce high or very hollow and incomplete sounds, between several paroxysms of an abrupt cough. A peculiar alteration of timbre has been noticed, the voice in one case becoming metallic; finally, mention has been made of *chirping*, a symptom which I will merely indicate now, and to which I will recur in discussing the final symptoms.

Deformity.—When a large body is situated behind the cricoid cartilage, it pushes the entire larynx forward, and the projection of Adam's apple is markedly increased. Hence the patients present a very peculiar appearance, especially when seen in profile; but this sign is rarely very well marked. This is also true of the deformities which may sometimes be present upon the lateral portions of the neck, and which are a valuable indication, though unfortunately very rare. Germain [1] reports that in a man, who had swallowed a bone, the foreign body lifted the skin to a centimetre and a half above the sternum.

Primary Emphysema is a very rare phenomenon, and I have found but one example in which it assumed disquieting proportions from the beginning. In order that it shall appear at an early period, a very irregular and sharp body must have perforated the mucous membrane and placed the cellular tissue in contact with the air, most frequently by means of a communication with the trachea. The following example is very interesting in this respect as well as in others:

Observation.—" MacLauren reports that a young man, while fishing in the low waters of a brook, wished to kill a fish, which he had caught, with his teeth. This fish, which measured three inches in length and a half inch in width (English measure), made a sudden movement and fell into his fauces. This was immediately followed by suffocation, nausea, efforts at vomiting, expectoration of blood and mucus, emphysema of the face, neck, and chest. The fish could easily be felt, but could not be extracted on account of its sharp fins which were imbedded in the tissues. Attempts to push it down proved fruitless, and the patient was then made to swallow a great deal of vinegar and water. The fins became detached, and in less than twenty-four hours the fish was pushed down. At this time the emphysema extended to the scrotum. Muco-purulent expectoration developed, and, on the third day, complete aphonia. All

[1] Recueil de Mém. de Méd. et de Chir. Militaires, 1re Série, T. 49.

these symptoms gradually diminished without any further interference, and the patient had recovered eight days later." (The Lancet, 1873.)

This concludes our remarks with reference to the primary symptoms, which, as we have seen, are very numerous and threatening. They are rarely isolated, and appear at the same time, increasing both the apparent and real gravity of this class of accidents. In conclusion, this entire group of symptoms constitutes a variable initial paroxysm, the issue of which is more or less rapid, and which results most frequently in resolution, though sometimes in death. Between these two extremes are found all gradations, and some of the symptoms almost always persist, such as pain, a sensation of obstruction and burning during deglutition, an alteration of the voice, etc. This initial paroxysm is often intended to produce a natural effort towards the expulsion or progression of the foreign body. In the first case vomiting plays the chief part and carries away the object with the other matters; while, in the second, the obstacle is removed by the efforts of deglutition and the action of the very abundant saliva and ingested food.

Primary expulsion in one way or the other is not extremely rare, but there is much less chance of its production if the body is irregular, pointed, cutting, and fixed in the wall. In a similar manner, the volume is of great importance in those bodies which are regular; however, the strangest articles have been expelled or swallowed shortly after their introduction. I will cite, among others, the case reported by Baraffio (1873) before the Florence Medical Society:

Observation.—A crazy soldier swallowed a spoon of ordinary size, but it could not be detected in any region accessible to the hand. Great dyspnœa developed soon afterward, and, at the same time, a swelling formed above the sternum. Then followed a period of rest, and the spoon was expelled during a violent fit of vomiting. The spoon had produced compression of the bronchi, and had gradually descended to the cardia, the irritation of which had given rise to the expulsive vomiting.

Roth presented before the Strasbourg Society of Medicine (1876) the case of a child who had swallowed a button which he did not evacuate. Two years later he swallowed another button, and this was followed by vomiting. Upon the second day, the second button was found in the vomited matter together with the one which had been swallowed two years previously. Where had the first button been concealed? According to Boeckel, the only place in which it could have been arrested is the pouch, which exists in certain individuals above the cardia.

Primary Death from Foreign Bodies of the Pharynx and Œsophagus.—Death, occurring primarily after the arrest of a foreign body, is a very rare phenomenon, and the small number of autopsies upon which the diagnosis has been based, will not permit another opinion. If we limit ourselves to merely noting the facts as they are reported in the books, the number of these cases of primary death will be very considerable. They do not belong, however, to foreign bodies of the pharynx and œsophagus, but in reality to those of the air-passages. In fact, large alimentary masses, large pieces of meat, etc., occupy the vestibule, and kill by asphyxia from obstruction to the passage of air. This does not imply that examples of death from bodies in the œsophagus do not occur, but their frequency is very limited; we must bear in mind that foreign bodies of the pharynx and of the upper part of the larynx present the same symptoms, and we are very much embarrassed by old observations like the follow-

ing. Suétonius reports that Drusus, the son of the Emperor Claudius, after throwing a pear up in the air, caught it in his mouth, and died of suffocation. In like manner Meeckren[1] mentions the case of a woman who, in order to remedy a large loss of substance in the roof of the palate, wore a cork obturator, which was undoubtedly poorly fitted, as she was suffocated by this body, which became detached and was found lodged in the pharynx. In fact these are rather examples of foreign bodies in the vestibule, and I will not insist any longer upon this variety of accidents, as I shall return to it in discussing foreign bodies of the air-passages.

CHAPTER V.

THE FATE OF FOREIGN BODIES OF THE PHARYNX AND ŒSOPHAGUS. —SECONDARY SYMPTOMS.

With regard to the final disposition of the foreign bodies, we must consider, on the one hand, those cases in which the body has been expelled, and, on the other, those in which the body remains. The sequelæ of the accidents are very different in the two cases: in one, the source of irritation remains; in the other, it has been lost.

I.—The Foreign Body no longer in the Œsophagus.—After the expulsion of the foreign body by the unaided efforts of nature, or by medical interference, all the symptoms usually improve, and at the end of a short time the patients may attend to their occupations, and eat as before. The disease disappears with its cause.

We entertain a wrong idea if we believe that this rule offers no exceptions. On the contrary they are very frequent, and secondary phenomena, varying from the slightest to the most severe, are observed. They are usually due to the prolonged presence of the body, which, by its volume, produces variable functional disorders. At other times the surgical manipulations, or the natural or artificial efforts of vomiting, give rise to lesions of the walls; finally, the body itself in certain cases has been known to irritate the canal by its presence, or to wound it by its irregularities. However this may be, the inflammatory reaction is very often observed under the form of diffuse or circumscribed œsophagitis. At first, after the foreign body has disappeared, the patient experiences a considerable immediate relief, which is due to the diminution of the reflex symptoms. This apparent recovery does not last very long, as the mucous membrane, which is contused, eroded, and at all events irritated, reacts and becomes swollen. The pain and difficulty of deglutition also reappear upon the following day. Sometimes fever is lighted up, and the dysphagia is as intense as it was prior to the expulsion. If we add a certain sensibility of the neck, and a dull pain at the moment of deglutition, we can form an idea of the phenomena which follow expulsion.

The group of symptoms does not pass beyond this intensity, and continues, on the average, for twenty-four or thirty-six hours, during which the patient cannot eat solid or irritating food. He then grows better, and recovery occurs within a few days. But if the inflammation is more

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[1] Obs. Chirurg., Chap. XXII.

acute, the symptoms of peri-œsophagitis are added to the previous ones. We then find fever supervene with the grave disorders which so frequently accompany deep suppuration in the region of the neck. When the pus has collected around the œsophagus and in its walls, it may make its way into the canal, which is the most usual termination. At other times it opens into the trachea, the pleura, or mediastinum, and gives rise to grave symptoms. The following is an example of the unfavorable symptoms which may follow expulsion.

Observation.—A little boy had swallowed a metallic pen, which was lodged in the pharynx. As the object was about to be seized, a sudden movement of the child caused it to fall into the stomach, whence it was soon expelled by an emetic. Upon the following day there was slight emphysema at the lower part of the neck. But fever then developed with all the signs of œsophagitis; deglutition was very painful, and a milk diet was prescribed. Vomiting occurred with expectoration of mucus and pus. Two weeks later the emaciation had increased, and the quantity of pus discharged was much larger; the most careful examination did not reveal anything in the pharynx or chest, and a diagnosis was made of a mediastinal abscess communicating with the œsophagus. Several spoonfuls of a one per cent. solution of chloral were administered every half hour. Improvement soon began to be evident, and, a month after the accident, he was out of danger. (Sée, Bulletin de la Société de Chirurgie, 1875.)

II. The Foreign Body has not been Expelled.—When the foreign body has not been expelled, several terminations may occur:

1. The primary symptoms persist.
2. Tolerance is established.
3. The foreign body becomes migratory.
4. The presence of the body produces symptoms.

Each of these divisions will be the subject of a special section; but all of them have not, by any means, the same importance, and interest centres almost exclusively in the latter, which is much richer in illustrations than the others.

a. Persistence of the Primary Symptoms.—If the initial paroxysm continues, instead of subsiding, the gravity of the accident becomes extreme, because all the primary symptoms threaten existence to a greater or less extent. Death is the usual termination of these unfortunate cases, in which the efforts of nature or art are equally powerless and ineffectual. But the other symptoms and functional disorders also possess a great influence in the production of an unfavorable result. Thus the unfortunate patients have been known to die of starvation, either because the body had not been recognized or had not been dislodged. Witness the following case observed in a young and robust man:

Observation.—A soldier swallowed a bone with his soup, and the foreign body immediately produced violent symptoms. An unsuccessful attempt was made to push the bone into the stomach. The object could neither be reached nor extracted. Little by little the vital energies of the patient declined, and nature was left to her own resources. Inanition soon developed, as even fluids were unable to pass. The suppuration which was relied upon did not develop, and the patient died in delirium on the twentieth day, in consequence of marasmus. At the autopsy the bone was found imbedded in the wall and forming a valve. (Recueil de Mém. de Méd. Militaire, 1re Série, T. 37, p. 260: Toussaint Martin.)

These unfortunate cases are, happily, very rare, and are only observed if the body which constitutes the obstacle is situated in the intra-thoracic portion of the œsophagus. Moreover, as surgical therapeutics progresses, the number of these unfortunate cases diminishes, and it is not justifiable to abandon the patients, who are doomed to an almost certain death, to themselves without previously resorting to all our instrumental resources.

b. Tolerance and Cyst-Formation.—From the beginning certain bodies pass unnoticed, and produce hardly any symptoms. Very frequently the existence of the body is barely revealed to the patient by a slight pain in a fixed spot during eating. The patient becomes habituated to this slight distress in the œsophagus, and accustoms himself to the abnormal body. This is the explanation of the cases of very prolonged tolerance which are reported in literature.

But in order to be tolerated, the foreign bodies must realize certain conditions, which have been discussed in the general study. The œsophagus is, in fact, very poorly disposed to the prolonged presence of objects which constantly irritate it. In addition, it does not present any cavities or dilatations, like other viscera, and its functions are of such a nature as to prevent the persistence of obstacles. The examples of its tolerance are rare, and they never refer to hard or soft cubic bodies. All those which are reported in the books were flat objects, like coins, flattened pieces of bone, or very thin and elongated bodies. In order to be tolerated, these objects (bones, needles) must adhere to the wall, and their long axis must be parallel to that of the canal. In this manner they will not prevent the free passage of food, especially fluids, and may remain harmless for a long time. We can hardly understand how individuals can retain five-franc pieces in the œsophagus for months without suspecting their existence. After a while the body, especially if it is not too large, forms a niche for itself laterally, in the mucous membrane, and becomes concealed; the frequent contractions of the muscular coat of the canal do not play an indifferent part in this process.

This termination supports the opinion of those who believe that foreign bodies are often arrested by some projection or abnormally developed valve. In some cases a sort of ampullary dilatation of the canal occurs above the body, rarely involving the entire periphery, but more often on the corresponding side. Below, on the contrary, there is a sort of narrowing. It has happened that surgeons have been requested to give their attention to individuals who presented an œsophageal stricture together with an arrest of a foreign body.

What was the primary affection? An observation of some cases justifies the belief that the foreign body has preceded the stricture in point of time.

If the foreign body can create a niche, a sort of cavity, we can readily understand that it can, in the same manner, become encysted after the lapse of a certain length of time. I hasten to state that if the cases of complete tolerance are rare, those of cyst formation are much rarer, and only occur in small and pointed bodies. This rarity is explained by the mobility of the canal, the functions of which are antagonistic to the formation of cysts.

c. Migration of Foreign Bodies.—In the same manner that some bodies may be encysted, they may also, without giving rise to inflammatory symptoms, traverse the tissues in various directions and reach the periphery. On the one hand, these bodies are sharp (pins, needles, spikelets of grass, heads of barley, etc.). On the other hand, all the force which is applied to them must have, for its resultant, a movement of ready progress in the direction of the long axis. Every one knows the facility with which a head of barley or grass runs up a person's sleeve when the stem is placed uppermost. A phenomenon of this kind occurs in the œsophagus, aided by the continuous contractions of the muscular coat; the needle is pressed into the parts, reaches the surrounding cellular tissue, in which

it is tolerated, or gives rise to the production of a peri-œsophagitis, terminating in an abscess.

If they are tolerated, these bodies creep along, without becoming encysted or only temporarily so, according to the character of the parts which they encounter. We may say, in general, that they have a tendency to pass downwards and outwards, as they are most frequently found upon the inferior and lateral portions of the thorax. Sometimes, however, they have been found directed towards the axilla. I have some reasons for believing that those which reach the axilla have come from the cervical portion of the œsophagus; on the other hand, those in the thorax have perforated the thoracic portion.

Nothing is more curious than the history of these migrating foreign bodies, which pass to the most distant regions through organs which are sometimes as important as the lung and pleura. But we must not imagine that their indolence is absolute. It often happens that, from unknown reasons, the body becomes a source of irritation, and leads to the formation of an abscess around it, or in the parenchyma of an organ. Sometimes, however, either because the body is changed, or because it is not subjected to the same expulsive forces as before, the object becomes arrested and encysted. Ambrose (New York Med. Record, 1870) found, in an autopsy upon a negress, a needle encysted in the heart: she had swallowed it nine years previously.

The indolence very often persists, until the foreign body arrives under the skin; then a rough and painful friction, a sensation of pricking, attract the attention of the patient. Usually, when the foreign body has completed its eccentric route, it forms an abscess which projects under the skin, and opens spontaneously or is opened by the surgeon. A small quantity of benign pus escapes, and the abscess gives exit to the grain or needle. But if the expulsion does not occur, the attention of the surgeon will remedy it after an examination of the abscess.

How long a time does a foreign body occupy in this process? We cannot tell exactly, but the period is very long, and the bodies may even remain for a long time under the skin without being noticed, and without forming an abcess; they have been known to remain there for several years.

The discussion of one of the most obscure questions in the history of foreign bodies of the œsophagus may now be entered into. Have the bodies which are found in the abscess of the thoracic walls come from the œsophagus or air-passages? The solution of this problem can be better solved in the chapter on foreign bodies of the air-passages, and I refer the reader to that section. It suffices, at the present time, to state that a large number of them undoubtedly have an œsophageal origin, but the brevity of the observations will not allow us to classify them positively.[1] The origin is not doubtful in some of the following examples:

Observation.—A needle, which had been swallowed and lodged in the œsophagus, penetrated the muscles, and a month later was found behind the right ear, where it was extracted by an incision. (Kéjes: Camp. Elys., Jucund. Quest. Gr., Sect. I., p. 1175).

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[1] Vigla has collected the most interesting of these cases of migratory foreign bodies. Hévin quotes several cases, in which corn-stalks were extracted from abscesses of the thoracic walls, 13–15 days after their ingestion. Bonnet, Helmontius, and Volgnarius have reported similar facts; the latter saw a corn-stalk emerge through the axilla; in Polisius' case the stalk made its exit three months afterward from an abscess in the back. Bally (Ac. de Méd., 1824) reports the ingestion of a stalk. Three months later peri-pneumonia, abscess upon right side of thorax between the second and third ribs, through which the foreign body emerged.

Observation.—A child had swallowed a needle, which was lodged in the œsophagus, and pierced its walls; it became imbedded in the muscles of the neck. It was extracted by an incision and the aid of a magnet. Kerckring (Obs. Anat., Obs. 44.)

Lavacherie[1] also mentions the case of a young woman who had a foreign body in the fauces which, after the lapse of a year, appeared under the skin near the sterno-clavicular articulation, whence it was extracted by an incision three months later.

d.—Symptoms produced by the Presence of the Foreign Body.—Under this heading I include all the acute or subacute inflammatory symptoms, and the perforations which place the œsophagus in communication with the air (trachea), the blood (vessels), and the serous cavities (pleura, pericardium).

I. Inflammatory Symptoms.—The inflammatory phenomena always begin a few days after the ingestion of the foreign body, and, when slight, very frequently pass unnoticed. The patient and the surgeon are naturally inclined not to attach too much importance to the symptoms, which are often common in simple cases. These phenomena are, moreover, the same as those which follow a slightly painful extraction. A sensation of heat and smarting in the neck, acute pain upon the slightest effort at deglutition, difficulty of respiration, and exaggerated sensibility of the region, are the local symptoms. But the general symptoms possess a gravity which will not escape the attentive observer. On the one hand, is a febrile reaction, which exceeds the limits of simple traumatic congestion; on the other are the nervous and circulatory disturbances which alarm the surgeon. When a foreign body has not been extracted or pushed onwards, and this reaction appears, there is every reason to suppose that an acute circumscribed or diffuse œsophagitis will develop, and that it will terminate in the formation of a peri-œsophageal abscess.

This termination was so well known to the ancients, that they expected it, and even founded their hopes upon its production, thinking that the reaction would sooner or later give rise to the evacuation of the foreign body which they could neither extract nor push forward. Fortunately such a plan is merely a matter of history at the present day, and we have means of avoiding further serious complications.

Thus the abscess has become inevitable; it projects into the canal, the functions of which it almost completely abolishes. At the same time it lays bare the œsophageal walls around it, enters the cellular interstices, and may, in certain cases, assume the greatest gravity.

What becomes of the foreign body during this time? In some cases (pins, pointed fragments of bone, pieces of glass) it plays the part of an irritant, and the abscess is produced by a sort of *vis medicatrix naturæ.* Nothing is more readily understood. But is it the same when the body is flattened or irregular, and applied to the wall like coins? Here the mechanism of formation differs, and we must attribute the œsophagitis to therapeutic manipulations, to the lateral compression of the edges of the bodies, and even to a commencing ulceration of the canal by the coin. The inflammatory reaction is slower in such cases.

Œsophagitis terminates in the formation of an abscess in the very walls of the canal; in peri-œsophagitis it is situated in the peripheral cellular tissue. Its gravity as well as final termination is very different in the two cases.

1. *The abscess is circumscribed in the walls.*—It is most frequently

[1] Bull. de l'Ac. de Méd. Belge, 1848.

due to the irritation produced by one of the irregularities of the foreign body. It then points towards the interior of the canal, and after a variable time, in which it only reveals its presence by functional disorder and pain, opens into the canal, carrying with it the liberated foreign body. As a rule the symptoms occur in the following manner: The symptoms gradually become more intense, and the pain less lancinating, but duller and deeper. The patient, tormented by unsatisfied hunger, makes vain attempts to swallow even some fluid food. All at once he is seized with a paroxysm of cough, suffocation, and efforts at vomiting; the face is injected, pinched, and his anxiety is at its height. A few seconds later the patient vomits a mass of yellowish pus, and very often, the foreign body at the same time. Afterward the pus more rarely becomes sanguinolent, and the functional disturbances gradually diminish until recovery, with or without organic change in the œsophagus.

It is a singular fact that this group of symptoms is exactly the same as that which I have described in speaking of the initial paroxysm. This is readily understood, if we reflect that when the pus is discharged, the foreign body irritates the walls more than ever; they contract upon it, and thus produce the entire series of reflex symptoms.

The body is not always expelled by acts of vomiting. Sometimes the abscess opens and the body is not noticed. It may evidently again engage in the wall or follow the normal course of the food, and fall into the stomach. This termination has been observed when the foreign body occupies the lower part of the canal.

Several isolated and circumscribed abscesses may open separately and in succession. But these cases are rarer, and we may attribute these successive formations to the reopening of an abscess which has closed up.

In the following case the body fell into the stomach, after a prolonged suppuration.

Observation by Gastellier (Journal Gén. de Médecine, T. 23, p. 147.)—A young man, æt. sixteen years, swallowed a six-livres coin. This piece of money became lodged in the middle of the œsophagus, whence it was impossible to dislodge it. Here it remained for six months, during which the life of the patient was in great danger, and continually gave rise to the most acute pains, to convulsions, and to vomiting of alimentary matters or mucus mixed with blood and pus. The patient sank into the last stages of marasmus. Finally, after six months of suffering, the coin dropped into the stomach, after a severe convulsion and fainting spell, and the young man then discharged a large amount of pus. The body was not evacuated until thirty-five years afterwards.

Abscesses caused by the presence of a foreign body may suppurate indefinitely. Emaciation then develops, and death may result. At other times, as in the following observation, which is interesting in more than one particular, the patient only owes his life to a lucky accident.

Observation by Gauthier de Claubry.—A bone lodged for fourteen years in the œsophagus and simulating phthisis.—Recovery (Recueil Periodique, T. 34, p. 13).—In 1780 a young girl swallowed a bone, while drinking soup. Severe symptoms ensued, which were relieved spontaneously. Hoarseness and a slight malaise, which was attributed to the efforts of propulsion and extraction, alone persisted. After a certain length of time the emaciation became considerable, the voice was lost, and severe cough ensued, which increased in a little while. The patient became sallow, fever developed, pain in the chest appeared, the expectoration became thick, grayish, and sanguinolent; the vital energies diminished, and the patient, being regarded by her physicians as in the second stage of phthisis, was treated accordingly. Fourteen years passed, during which these symptoms continued. Gauthier, who then saw her, at first sight thought that she was in the last stages of phthisis. A very careful examination led him to correct his first opinion, and he attributed the long series of symptoms to the presence of the foreign body. He found the back of the mouth filled with pus and blood, and the

pharynx inflamed. He made slight pressure along the neck, and the patient moved and stated that she felt pain when the fingers pressed upon the neck near the clavicle. The author then decided to employ emetics, but, when he was about to commence treatment, she had some attacks of vomiting; after having felt a pain in the fauces as if something had torn, she expelled the bone which for fourteen years had been the cause of the symptoms. Under appropriate treatment she improved considerably within a few days, and recovered entirely within six weeks.

2. *Abscesses due to peri-œsophagitis.*—Their causes are the same as those of abscesses in the walls, and, in addition, the presence in its entirety of a foreign body, which is not tolerated by the surrounding cellular tissue. These causes are: the contusion by external manipulations or foreign bodies, and all the irritations which are produced by its irregularities. They produce the same symptoms as the preceding, but less intense. In addition, the formation of an abscess is indicated by symptoms of intense dyspnœa, and by œdematous swelling of the entire region of the neck, in which fluctuation may be detected.

When it has attained its full development, this peri-œsophagitis may cause death on account of the intensity of its symptoms, and of the disturbances which it produces in the principal functions.[1] Marasmus and inanition are added to these disorders, and death occurs before the abscess opens.

When the suppurating peri-œsophagitis pursues a regular course, it may terminate in the following different ways:

1. The collection opens into the œsophagus.
2. The collection opens externally.
3. It opens into a neighboring organ.

1°. The abscess opens into the œsophagus: This termination is much more liable to be produced if the foreign body presses upon one point of the wall, and if there is an eschar or ulceration at this point. When once opened, the abscess acts like those in the walls, sometimes carries off the foreign body, and heals up more or less slowly. But matters may not terminate in such a simple manner, as is seen in those cases in which suppuration is prolonged indefinitely, and in cases of vertebral caries secondary to the œsophagitis.

Observation.—A soldier swallowed a bone while drinking soup; the foreign body was pushed down with a leek, and the patient appeared to recover. Eight days later, difficulty of respiration developed, which gradually increased. Dull pain in the anterior region of the neck and between the shoulders; no tumor perceptible; the voice hoarse and deep. Leeches and active local treatment were employed. The vomiting which was produced only gave rise to an expectoration containing black streaks. The marasmus increased, and the patient died upon the thirty-first day.

At the autopsy, a slight redness was found in the larynx, the posterior wall of which presented a gentle and elongated projection like the feather of a crow. Perforation of the œsophagus opposite the fourth and fifth cervical vertebræ, the bodies of which are superficially softened, black, and carious. At the anterior part there is a second depression, six millimetres deep, communicating with the laryngeal projection, the latter being a purulent foyer containing debris of the cucoid cartilage. No foreign body was discovered. The efforts at propulsion had undoubtedly produced this accident. (Recueil de mémoires de médecine et de chirurgie militaires.)

Grellois has presented an analogous case to the Anatomical Society (1835), in which a bone had also produced vertebral caries and death in a cuirassier.

Observation.—Lodgment of a bone in the œsophagus.—Vertebral caries.—Death.—An infant, æt. twenty-two months, swallowed, on January 15th, 1806, a small flat and

[1] Bull. de la Soc. anat., 1869, p. 305.

triangular bone. The body lodged in the pharynx, and produced pain, paroxysms of cough, vomiting, and marked alteration of the voice. The next day the neck was swollen, the voice hoarse, and the head drawn to one side. Nevertheless, the child did not complain, ate and drank as usual, and the presence of a foreign body in the pharynx was not suspected. The swelling disappeared in a few days, but the head remained deflected. The voice was hoarse, and the breath fetid. Seventeen days later, the symptoms led a physician to believe that there was a chronic inflammation of the laryngeal mucous membrane, and he treated it accordingly. Several physicians who were summoned suspected tetanus from the contraction of the muscles of the neck. Deglutition continued to be performed with facility, but marasmus developed. Upon March 4th he discharged a small bone after a violent spell of coughing. The symptoms did not improve, and death occurred on April 5th. At the autopsy, an ulceration was found on the posterior wall of the pharynx opposite the body of the third cervical vertebra. The bodies of the second, third, and fourth vertebræ were carious. The membranes of the cord were changed. (Journal général, T. XIII., 1807.)

Mondière [1] has published an equally interesting case of death from the opening of a peri-œsophageal abscess into the canal.

2°. The collection tends to open outward: This second category is characterized by the slowness in the progress of the abscess. Months usually elapse before the pus makes its way through the tissues and opens externally. In order to avoid all confusion, we must add that these collections differ from those which accidentally appear at a point more or less remote from the œsophagus, and which usually contain the foreign body in their interior. We must recollect that, in the first instance, the pus has originated around the œsophagus, while, in the latter, it forms at a distance from the canal. The pus is immediately directed towards the skin by invading the cellular spaces and separating the muscles; it raises up the corresponding side of the neck, and projects, by preference, into the carotid groove. If the collection forms in the thoracic cavity, it will not find a ready means of passing outwards, and the most disastrous accidents, such as the penetration of the pus into the mediastinum or pleura, may occur. The majority of examples of external abscesses have been observed in the neck. When left to themselves, they open externally, internally, or in both directions at the same time, if the collection is allowed to become as large as in the following case:

Observation.—Fortuné reports the history of a soldier who swallowed a piece of bone with his soup. Propulsion and emetics failed, and a considerable swelling of the neck developed. Several venesections were performed, and soothing cataplasms were applied. For twenty days the unfortunate patient was fed through the œsophageal sounds. Deglutition returned at a later period, but purulent expectoration and inflammation of the larynx appeared. The voice was changed, and became extinct when the dyspnœa and expectoration increased; general debility. Three months later, an abscess on the left side of the neck; incision. In it was found a piece of thin, rough bone, twenty-three millimetres long, and pointed. Nevertheless the laryngo-tracheitis persisted, together with the pulmonary symptoms. The man recovered five months after the accident.

3°. The abscess opens into a neighboring organ: This very rare termination is one of the most serious, and is observed when the pus, which has formed around the œsophagus, opens into the trachea, pleura, or pericardium, or even into the posterior mediastinum. This accident is indicated by a chill, high fever, syncope, and the most serious symptoms. If there is a communication into the trachea, the opening is usually small, and the almost inevitably fatal result occurs slowly. The perforation is often produced by the foreign body itself, but I will recur to this variety of accidents in discussing perforations. The following is an example of tracheal communication:

[1] Arch. gén. de méd., 1830.

Observation.—"A man, while playing with a boiled chestnut, threw it into the air and opened his mouth to catch it. It lodged in the fauces, and produced death on the nineteenth day. When the neck was opened, upon autopsy, a dépôt, containing a great deal of pus and the whole chestnut, was found on the left side beneath the pharynx and thyroid body. The œsophagus was very much constricted above and below. The abscess communicated with the trachea, which presented an opening as large as a pea." (Guattani: Mém. de l'Ac. chirurgie, T. 3, p. 344.)

II. Perforations.—Ulceration and perforation may follow the œsophagitis and abscesses described above. However, there is another manner of production from within outwards, but much slower than the preceding, which is produced from without inwards. Furthermore, these perforations are not usually accompanied by inflammatory reaction; they are produced slowly and insidiously, and are always the result of gangrenous eschars. The necrosis of the mucous membrane and other tissues is explained by the compression produced by the vigorous contractions of the œsophagus upon the foreign body. The chances of its production will be greater, if the foreign body is large, firm, flattened, and irregular.

It must be flattened in order not to interfere entirely with deglutition; it must be firm in order to allow the œsophagus to be compressed. It must also be somewhat irregular and rough, in order to irritate the œsophagus more frequently, and to produce péristaltic contractions. Coins fulfil all these conditions.

The ulceration may only involve the mucous membrane, and the accident will pass unnoticed, if the body is eliminated; if not, the ulceration involves the entire thickness of the canal. Its progress is slow; the surrounding cellular tissue is thickened, and separates the adjacent organs from one another. A sort of natural elimination is thus produced until the body reaches some important organ—a blood-vessel, the trachea, lung, mediastinum, etc. The first part of the process is effected without the knowledge of the patient. The second usually terminates in death, by asphyxia in cases of tracheal communication, and by an almost fulminant hemorrhage when a vessel is perforated. I will now study each of these varieties.

Fig. 2.—Perforation of the œsophagus and trachea by a bone. (Dupuytren's Museum.)

1. *Perforation of the trachea or bronchi.*—Among a very large number of œsophageal perforations there are only eight or ten cases of perforation into the trachea or bronchi. As a rule, the accident is announced by bronchial symptoms. The patient had hitherto suffered little or not at all; a few months previously he had swallowed a foreign body, which he no longer thought of, or which he believed had been pushed down or eliminated. After a certain length of time, he experiences a very dull pain in the neck or chest. Cough supervenes, of a paroxysmal nature, with mucous expectoration, sometimes streaked with blood. The difficulty increases as the ulcer progresses. As soon as the communication is established, the deglutition of food and also usually of saliva produces formidable attacks of suffocation, which result from the entrance of a portion of

the substances into the canal. From this time until death, the unfortunate patient has not a moment's rest, is a prey to the most violent attacks of suffocation, and is inevitably doomed to a slow death, which occurs from asphyxia and inanition. The following example is extremely instructive:

Observation.—A child of five or six years, while amusing himself with a small toy house, during which he had a saucer in his mouth, received a blow upon the chin, and swallowed his toy. He was given an emetic, and then felt better. Slight dysphagia. Four months passed in this manner. In the fifth, the child was seized with an attack of croup; upon the second day he could not swallow anything without vomiting. A flexible tube was pushed into the œsophagus, and the catheter was arrested by an obstacle which was pushed away by pressing a little forcibly. The air then entered through the tube. This manipulation cleared up the diagnosis considerably. Nutritious enemata. Rapid emaciation and death. At the autopsy the foreign body was found in an opening about five inches deep, between the œsophagus and trachea. The glottis and upper part of the trachea were entirely healthy, but almost a third of the foreign body was engaged in an ulcerated fistula communicating with the trachea; it was about an inch and a half in length; its edges and the adjacent mucous membrane were inflamed. The œsophagus was relatively narrowed below. (Edinburgh Med. Jour., 1848.)

Fig. 3.—Perforation of the aorta by a swallowed bone. The point of perforation is indicated by a stylet. *C*, carotid. *SC*, subclavian. *Œ*. œsophagus. The bone is represented at the side. After Shetter (Langenbeck's Arch., 1878).

Mondière (Arch. de méd., 1833) has published other cases of this kind.

Authors mention, as an example of ulceration into the trachea, a case quoted by Hévin referring to a woman who had swallowed a bone which could neither be extracted nor pushed down. Among other symptoms, she presented a "chirping of air" in the fauces. Ten months later the bone was expelled while coughing. She ate with great ease. This observation refers to a foreign body of the air-passages, and not of the œsophagus.

2. *Ulceration and perforation of the vessels.*—The position of the œsophagus in the midst of the large vascular trunks of the neck and thorax sufficiently explains the frequency of a very grave accident, which is beyond the resources of art, and which always carries off the patients. These vessels are: 1st, the aorta, which is situated behind and to the left of the œsophagus; 2d, the vena azygos; 3d, the pulmonary artery; 4th, the inferior vena cava; 5th, the carotid; 6th, the inferior thyroid artery; 7th,

the right subclavian, when abnormally situated; 8th, the œsophageal arteries. It is not astonishing, therefore, that thirty cases of death from hemorrhage, due to ulceration or perforation of one of these vessels, have been recorded.

From a pathological point of view, these perforations are divided into two groups, according as they are primary or secondary. While the first result from traumatism, from the wounding of a vessel by one of the projections of the foreign body, the second, on the contrary, are produced slowly by ulceration of the artery after the œsophageal perforation. There are two cases in the literature of primary perforations, and we need not be surprised, after the preceding remarks, to find that they were produced by a pointed bone and by a needle.

Observation.—A man, æt. fifty-six years, entered Steeven's Hospital on March 30th, 1855. While eating, the patient had experienced a sensation of rupture in the chest, and this pain increased very much during deglutition. Almost immediately afterwards he began to spit blood in large quantity, at first black and then ruddy. The day following the accident he vomited a bone about an inch long, irregular and with cutting edges. He died the same day at 9 o'clock. Blood was found in the pleura, pericardium, and posterior mediastinum. A vertical rupture of the posterior wall of the œsophagus, half an inch long, and corresponding to a rent in the wall of the aorta; blood in the stomach and small intestines. (William Colles: The Dublin Quarterly Journal of Med. Sciences, 1855, Vol. XIX., p. 325.)

Another illustration, which is very interesting despite its brevity, was observed in England, in a man forty-seven years of age, named Volon, who died very suddenly after vomiting blood. Examination of the cadaver showed that a needle had perforated the posterior wall of the œsophagus, and wounded the aorta, in the walls of which it was found lodged.[1]

The thirty-three other cases are examples of slow perforation by ulceration. I will not again refer to the mechanism by which these communications are made, confining myself to the statement that they are secondary to an eschar which, by gradually becoming deeper, finally involves the walls of the vessels. In the order of frequency, the figures are arranged in the following manner:

Aorta		17
Carotid	left	3
	right	1
Vena cava		2
Inferior thyroid artery		1
Right coronary vein		1
Demi-azygos vein		1
Right subclavian artery (abnormal)		1
Œsophageal arteries		1
Unknown artery (no autopsy)		4
Pulmonary artery		1
		33

On account of the importance of the subject, I will here introduce the bibliography of these cases.

[1] Lancet, 1877, Vol. II., p. 789.

1st, Aorta:
- Observation by Martin, Bégin (Mém. de méd. milit., 1832).
- Observation by Wagret (O. de méd. et de chir.), 1718.
- Observation by Laurencin (Arch. de méd., 1824, T. VI., p. 302).
- Observation by Dubreuil de Brest (Journal universel, T. IX.).
- Observation by Auvert de Moscou (selecta praxis. méd. chir. mod., Tardieu, 1850).
- Observation by Bégin (Mém. de méd. milit., 1832).
- Observation by Révolat (Ann. de. Soc. de méd. prat. de Montpellier, T. II., p. 247).
- Observation by Duncan (Ann. de la chir. fr. et. étr., 1844).
- Observation by Lavacherie (Méd. de l'Ac. de méd. belge, 1848).
- Observation by Spry and Farquharson (Trans. of London Path. Soc., 1869, Vol. XIX, p. 219).
- Observation by Hugues (Lyon médical, 1870, No. 17).
- Observation by Ramskill (Lancet, 1871, I., 19).
- Observation by Laurence Bradley (Med. Times and Gazette, 1868).
- Observation by Théron (Gaz. des hôp.), 1862.
- Observation by Shetter (Langenbeck's Arch., 1878).
- Observation by Bousquet (Bull. de la Soc. anat., 1877).
- Observation by Denonvilliers (Soc. de chir., 9 janvier, 1856).
- Observation by Aschenborn (Berlin. klin. Wochens., 1877, T. XIV.).
- Observation by Mienné (Gaz. des hôpitaux, 1871).
- Observation by Haurmin (Rec. de méd. militaire, 1825, T. XVI.).
- Observation by William Colles (Dublin Quarterly Jour., T. 19, 1855).

Left carotid artery:
- Observation by Dumoustier (Réc. de mém. de méd. milit.).
- Observation by Auvert (Selecta praxis. méd. chir., Tardieu, 1850).
- Observation by Reid (Edin. Med. and Surg. Journal).
- Observation by Cripps (Lancet, June 8th, 1878, p. 834).

Vena cava:
- Observation by Laurent Lovadina (J. complém. du Dict. des Sciences médicales, T. I., 1818, p. 93).
- Observation by Cæster (Berlin. klin. W'schr., 1870, 43).

Inferior thyroid artery:
- Pilate (Bull. de la Soc. anat. de Paris, 1867, p. 648).

Right coronary vein:
- Observation by Andrew (Lancet, 1860).

Demi-azygos vein:
- Saucerotte (Ann. de la Soc. de méd. pratique de Montpellier, T. II., p. 247).

Pulmonary artery:
- Bernast (Jour. hebd. des. sc. méd.), 1833.

Right subclavian artery (abnormal):
- Kirby (Dublin Hosp. Rep., T. II., p. 224).

Œsophageal artery:
- Monestié, in Bull. de la Soc. anat., 1833.

Unknown artery:
- Lavacherie's cases, quoted above, and Jour. gén. de méd., T. XXIV.

Unknown artery:
- Erichsen, Lancet, Vol. I., p. 189.

The much greater frequency of aortic perforations is not astonishing, in view of its size, and of the intimate manner in which the two organs are attached over a considerable extent. If, however, we take a glance at the character of the bodies which have produced the perforation, we will find that this class of accidents is most frequently produced by pieces of bone. Then follow, in order of frequency, coins, fish-bones, artificial teeth. However, all irregular, firm, flattened, or pointed bodies can produce them. After what lapse of time do these perforations develop? It is evident that, in order to answer this question, we must introduce another element, which varies according to the case—that is to say, according to the shape, size, and irregularities of the foreign body. The larger it is, the more quickly gangrene will ensue, causing, in its turn, ulceration of the vessel. Nevertheless the time after which the primary hem-

orrhage occurs is very variable. The large majority of cases appear from the fifteenth to the twenty-fifth day; but the exceptions to this rule are very numerous, the hemorrhage developing either earlier or later. Moreover, surgical interference is not immaterial, and it has happened more than once that the surgeon has forced a body, which he thought he had pushed into the stomach, into the œsophageal walls. It is unnecessary to add that such a manipulation would only hasten the denouement. The case usually runs the following course: An individual swallows a foreign body, which either gives rise to symptoms, or remains indolent. In the latter case the arrested body does not attract attention, and the unfortunate patients are only astonished because it is not evacuated. If symptoms are produced and they yield to deceptive curative measures, the attention is likewise diverted. Hence, after having attempted propulsion, and finding the patients enjoying undisturbed health, the surgeon, satisfied with the result of his interference, leaves them to themselves. It is certain that the appearances in such cases may be very deceptive; thus, Wagret's patient, after a physician had made attempts at propulsion of the bone, "*experienced entire relief, and said to his benefactor that he thanked him very much, and that he had saved his life.*" A few days later the patient died from perforation of the descending aorta.

Fig. 4.—Perforation of the œsophagus and aorta by a five-franc piece (Denouvilliers). (Dupuytren's Museum.)

The onset is very insidious, and there is no prior indication of the accident, which is characterized by vomiting of red or black blood, according as it proceeds from a vein or artery. But the patients very rarely die from the first hemorrhage; the latter is usually arrested, and the patients merely remain in a condition of extreme weakness. Surgeons have been struck by this intermittence of the hemorrhage, and have endeavored to explain the manner in which a vessel as large as the thoracic aorta may be closed up after having been perforated. Shetter[1] attributes the intermittence to two causes: 1, a temporary occlusion of the wound of the aorta; 2, the weakness of the contractions of the heart. This theory is plausible, but it is founded upon analogy rather than upon an observation of facts. The process is a sort of hemostasis, like that described

[1] Shetter: Langenbeck's Arch., 1878.

by Valsalva. The blood, being pushed with less force by the weakened heart, and being changed in its composition, is in the most favorable condition for the formation of an obstructing clot. When the heart has recovered its previous energy, and the condition of collapse has given place to a slight reaction, the clot is displaced, and the hemorrhage reappears. The lapse of time between them is not considerable, varying from a few hours to several days.

Fig. 5.—Perforation of the inferior thyroid artery by a swallowed bone (Pilate). (Dupuytren's Museum.)

But in the intervals the functions are almost abolished. The patients are a prey to intense thirst, but cannot swallow the slightest amount of fluid without being threatened by a renewal of the hemorrhage. In some cases, especially when the perforation is small, and is situated in the lower part, all the blood flows into the stomach, and then passes into the intestines. The individual then presents, in the midst of perfect health, all the symptoms of internal hemorrhage, the diagnosis of which is extremely difficult. In one case this internal hemorrhage was only manifested by some colicky pains. It is hardly necessary to add that all measures tried, up to the present time, have proven fruitless, and so much more so as the treatment is regulated by the often very uncertain diagnosis.

As a type of this class of accidents, I will cite the following observation, taken from Bégin's treatise:[1]

Observation.—On March 16, 1824, Corporal Martin, after having called the muster of his mess, and amusing himself for some time with his comrades, was seized with an abundant hemorrhage. Without any known cause or any previous pain, he suddenly vomited the food which he had eaten five hours previously, mixed with a quantity of blood, partially fluid and partially coagulated, which was estimated at about one and a half litres. I was summoned soon afterwards. M. had a full pulse, though not firm or accelerated, his face was pale, and the entire body was covered with a slight moisture. The patient was quiet; he felt no pain, and only complained of a slight uneasiness, which he referred to the anterior part of the neck. Respiration, however, was perfectly free.

Upon the 17th, towards eight o'clock in the morning, the hemorrhage was renewed with violence. When I arrived, all assistance had become useless, and the patient died ten minutes later. The second hemorrhage, estimated at four or five pints, consisted of fluid, vermilion blood. I was then told that the patient had several times

[1] Recueil de mém. de méd. milit., 1832.

swallowed six-franc pieces, which he usually evacuated several days later, after taking salts, and that, fifteen days previously, he had swallowed a similar coin, which had not been passed. A six-franc piece was found in the œsophagus, opposite the bifurcation of the bronchi, firmly held by the walls of the canal, and placed on edge. The coin was, so to say, imbedded in two deep erosions, which were produced by those portions of its diameter corresponding to the sides of the canal. The pale appearance of these solutions of continuity indicated that they were the result of an old inflammatory process, and that the coin had, for a long time, occupied the place in which it was found. The erosion on the left side presented, in its centre, a black speck as large as a pea—a sort of clot, or slightly resisting, soft eschar. A blunt stylet, introduced in this spot, penetrated without difficulty into the aorta, which, when laid bare, presented a round opening two lines in diameter.

Upon looking over the cases reported by authors, we will find that the lesions found upon autopsy present a great analogy. Sometimes the opening is narrow and imperceptible; sometimes, on the contrary, it assumes the shape of a cleft. This latter appearance has been noticed under two different conditions: on the one hand, when the object was flat like a bone, and on the other when the vascular lesion was the result of violent manipulations in extraction or propulsion. Finally, it is common to find several ulcers at the same time, and especially at a point opposite to the perforation of the vessel. In Shetter's case there were two purulent foci in this part of the canal. The stomach and intestines are almost always filled with blood. Nor is it rare to find the foreign body itself astride the œsophagus and wounded vessel.

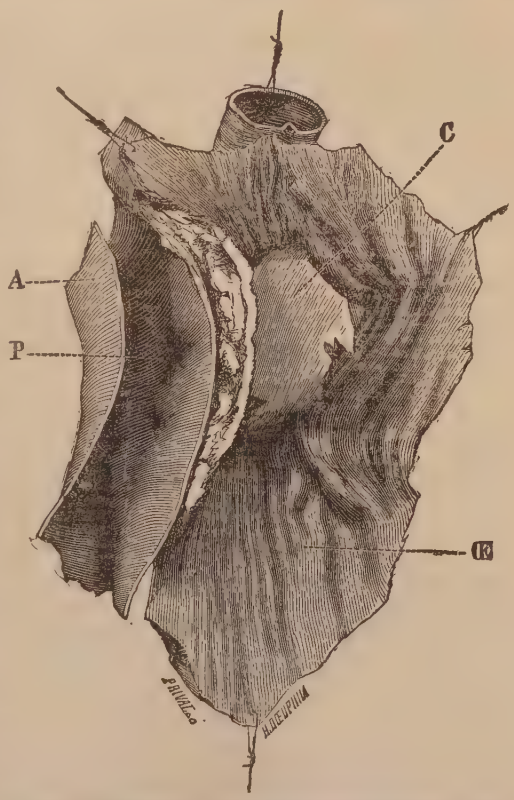

Fig. 6.—Perforation of the aorta and œsophagus by a very irregular bone (Bousquet). (Dupuytren's Museum.) *A*, aorta. *P*, site of perforation. *C*, foreign body. *Œ*, opened œsophagus.

Andrew's case, in which the right coronary vein was the site of a large wound, is an extremely striking example. The author thinks that the perforation was slowly produced and in some sort by a progressive ulceration, under the influence of the contractions of the heart.

Aschenborn had occasion to observe one of these grave cases in a young man, æt. 19 years, who first had a suppurative peri-œsophagitis, and, a few days later, a perforation of the aorta a short distance from the stomach. The foreign body was thought to be a crust of bread, but proved to be a

needle. The œsophagus was perforated at its posterior part. There was an infiltration of blood between the œsophagus and the aorta as far as the stomach.

In concluding the history of vascular perforations, and in order to introduce a note which is somewhat less dismal in the midst of this necrology, I will mention a case which demonstrates that the hemorrhage may be arrested and recovery occur.

Observation (Journal général de médecine, T. 24).—A six-livre coin, placed in a drunkard's glass and swallowed, was arrested in the œsophagus; being turned on its side, it permitted the passage of fluids. It remained here for fourteen days, and could neither be extracted nor pushed on; a very considerable vomiting of blood then occurred, which was renewed four times at very short intervals, and was followed by syncope. To the astonishment of all, the patient then came to, and was in a condition of unusual calm and tranquillity; long convalescence.

3. Perforation of the Pleura, Pericardium, etc.—Among the complications which have been observed after the arrest of foreign bodies in the œsophagus, we must also mention the perforation of the adjacent serous membranes (pleura, pericardium). These very rare accidents (it would be difficult to collect more than four or five authentic examples) are, like the preceding ones, of extreme gravity, and immediately give rise to pneumonia, purulent pleurisy, pericarditis, etc. Busch's case is perhaps the only example of recovery after such an accident.

Observation.—An individual had swallowed a foreign body, which formed a communication between the œsophagus and right pleura. This communication led secondarily to pneumo-thorax and purulent inflammation of the pleura, developing three days after the ingestion of the offending body; no portion of it could be discovered. The empyema recovered after operation and injections. (Hayem, T. IV., p. 263.)

The pleura was also perforated in a case reported by Mondière (Hope); in this case fragments of glass had been swallowed by a man during an orgie.[1]

Should we consider those cases, in which purulent collections of the mediastinum have opened into the pericardium, bronchi, and œsophagus, as examples of perforation caused by foreign bodies? These are merely theories, and nothing justifies us in regarding Bertrand's[2] case, published by Bussard, as an example of perforation of the pleura by an œsophageal foreign body; not only had the patient not swallowed any foreign body whatsoever, but there was none found upon autopsy.

Twenty years ago an American journal published a very curious and rare example of purulent pericarditis, secondary to the ingestion of a foreign body. The history of the case is as follows:

Observation.—A man had swallowed two mounted artificial teeth; pain in the epigastrium on the following day, then everything was restored to the normal. More serious symptoms on the fifth day; malaise, anorexia, obstinate insomnia, fever, vomiting, delirium. Suppurating pericarditis, death. At the autopsy pus was found in the pericardium, and the foreign body was situated seven centimetres above the cardia, where it had perforated the posterior wall of the pericardium. (Buist: Charlestown Jour., 1858.)

Death from Foreign Bodies of the Pharynx and Œsophagus.—The accidents produced by the presence of foreign bodies in the œsoph-

[1] Mondière, Arch. de méd., 1830. [2] Gaz. hebdomadaire, 1874.

agus may cause death at all stages of the affection. However, in order to facilitate matters, we may distinguish cases of primary death and those which occur after the lapse of a certain length of time from various complications. In the first group are ranged the deaths from asphyxia, suffocation, laryngeal compression, in a word, all the cases which are produced in the course of an initial paroxysm. When these spmptoms increase in severity, they compromise life, and their persistence alone will suffice to produce death. I have previously stated, however, that cases, which are in reality of a laryngeal character, have been too often included in the category of œsophageal foreign bodies. The proportion of eighteen among eighty-eight cases collected by Lavacherie far exceeds the truth.

Cauchois has published a very curious example of death by asphyxia from compression of the trachea, and I will concisely report this observation:

Observation.—Foreign body in the œsophagus, asphyxia from compression of the trachea.—A young man, æt. 27 years, entered the Lariboisière, on Aug. 25, 1872, with a slight cough and expectoration, which he had had since April; the suffocation having increased, he entered the hospital. The thyroid body enlarged on the left side and movable; wheezing could be heard at a distance from the patient. Cyanosis; signs of suffocation; examination of the pharynx negative. Upon auscultation, absolute silence over the left lung, which is resonant; nothing in the neck upon palpation. On account of the obscurity of the symptoms, only medical treatment was adopted (emetic, eight leeches to base of neck). On the next day the symptoms increased, and the patient died during the day.

At the autopsy, in addition to the crdinary lesions of asphyxia, the posterior wall of the cervical trachea presented a notable projection over the first four rings, as large as a nut, longitudinally oblong, and was almost in contact with the anterior wall, which was slightly depressed by the goitre. Upon cutting open the œsophagus, an excavation was found below the cricoid cartilage upon the right side of the anterior wall. A foreign body was extracted from it, covered with purulent detritus and resembling the palatine bone. (Cauchois: Bull. Soc. anatomique, 1872, p. 44.)

In this case death occurred at an unknown period after the ingestion of the foreign body, but it is interesting on account of the analogy which exists between the mechanism of its production and that of death in the initial paroxysm.

Death is much more frequently secondary, and then occurs after inflammatory reaction, or from inanition and marasmus, or finally from perforation of an important organ. Some examples of each of these varieties have been reported, and I will not insist further upon their history. But in order to be complete, we must mention the possibility of nervous paroxysms. To this category belongs the following case, occurring in a girl who died of eclampsia, produced by a foreign body.

Observation.—A little girl, æt. a year and a half, swallowed an Austrian kreutzer, on the 17th of May, 1876. She was soon afterward seized with vomiting, but was unable to expel the foreign body. On the following day the child presented no other symptoms besides the difficulty of swallowing. During the first eight days she only took liquid food, and, for five weeks, the patient did well. But on the 22d of June the child was suddenly seized with eclamptic convulsions, which recurred with every attempt at drinking; no regurgitation occurred at any time. Symptoms of dyspnœa were also absent. At the autopsy the coin was found in the œsophagus, placed in such a manner as to leave the passage free. The two edges, which were in contact with the mucous membrane, had ulcerated it, but there was no perforation of the œsophagus. (Mayer: Deutsch. Arch. für. klin. Med., Vol. 17, p. 120.)

This unique example is an exaggeration of what has been frequently observed in the beginning—that is to say, the existence of convulsive or

spasmodic symptoms; but it is, nevertheless, a very curious case, which perhaps approaches some others of this character, produced by the arrest of bodies in the air-passages.

Remote Symptoms produced by the Presence of Foreign Bodies.—It is not astonishing that the continued presence of bodies which are lodged in the œsophagus should produce cicatricial strictures of that organ. In some cases the initial dysphagia does not disappear entirely; slight regurgitation is superadded, which is much more marked if the previously inflamed and ulcerated mucous membrane is cicatrized over a large area.

But we cannot so readily admit, with some of the older authors, that the presence of foreign bodies favors the development of scirrhus. Mondière, at a not very remote period, still insisted upon this manner of the production of neoplasms, which he attributed, in great part, to the irritation and the slow or chronic inflammation, favored by individual predisposition. The partisans of this ill-founded opinion summon to their support Littré's case of a female who died of scirrhus produced by a fish-bone, and that of Godelius[1] who found that a pin, lodged in the thoracic portion of the œsophagus, had given rise to scirrhous stricture of that organ. Without positively denying the possibility of these facts, I think that new observations are necessary to settle the question, and, until this is done, we are justified in the belief that the results of the cicatrization of abscesses or ulcers have been mistaken for the neoplasms.

CHAPTER VI.

DIAGNOSIS.

Diagnosis.—As diagnosis serves as a guide for the conduct of the surgeon, the latter should endeavor by all means to make it precise. And this is not so simple as is laid down in the books, nor so easily effected as is generally believed. The correct diagnosis has very often been made in the dead-house, and it is sometimes very fortunate that the surgeon has not, in consequence of an involuntary error, needlessly treated the patient. Thanks to the progress of surgery, the more precise means of investigation tend daily to render the task easier.

The first question to be answered is the following: Is a foreign body arrested in the œsophagus or not? In order to answer this, we must inquire of the patient, or the by-standers, the circumstances under which the accident was produced. The information which we may obtain from this source is often very useful, when the patients are adults, but we must not believe that these data will relieve us from the necessity of a more careful examination.

The first information is very often wanting, if the patients are insane, hysterical, drunk, or infants of a tender age, so that they are unable to speak. On the other hand, some persons swallow foreign bodies without knowing it, and nevertheless feel their effects after a shorter or longer time; the following case belongs to this category.

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[1] Mém de l'Ac. des sciences, 1716.

A man, æt. sixty-five years, swallowed a set of teeth two inches long, during a fit, producing dysphagia, which was attributed to paralysis of the pharynx. The patient could only be nourished by fluids. Five weeks later, upon looking for his set of teeth, he was unable to find it, and it was ejected fifteen months later during a paroxysm of coughing. (Hayem, T. I., p. 97.)

But how great does the embarrassment of the surgeon become, when not alone is the history of an accident wanting, but when the patient, in addition, leads him astray! It is then very difficult for him to continue these investigations, and he must, therefore, rely upon a very careful exploration.

Observation.—Watson Dore reports in the Lancet (1875) the case of a man who had swallowed an iron hook, which he retained for a long time, and which finally inconvenienced him to such an extent that he was forced to seek relief. He did not wish to say exactly what the body was that he had swallowed, and it could not be extracted. One day while eating meat he became suffocated, and a nurse then withdrew the iron hook, together with the piece of meat, from the patients' fauces.

Similar to the preceding is the case cited by Mondière, of a carpenter, who, during a debauch, swallowed the pieces of his glass, which he had broken between his teeth. Ashamed of this act, and though a prey to the most violent symptoms, he did not dare to tell of his deed, and stated that he had swallowed a bone. The autopsy established the truth of the matter.

Finally, we must not forget that individuals who have swallowed a foreign body may be unable to speak of it on account of the pain and suffocation. We may then resort to writing in order to obtain the details of the accident. In conclusion, the physician should inquire into the history without attaching too great importance to it.

Then a study of the symptoms which are present, or which may have appeared since the accident, may corroborate the history and guide the physician. As we have previously seen, these symptoms are grave, and usually do not permit us to remain in doubt. When the initial paroxysm is well marked; when the patient is suffocated, and is subject to extreme agitation, to violent attacks of coughing, to incessant efforts at vomiting; when the voice is hoarse and altered, the deglutition of solids is almost impossible, and the anxiety has reached its culmination, the diagnosis forces itself upon us.

But are these symptoms always manifested? Evidently not, since we have seen that they may be almost entirely absent. I have previously mentioned the case of an individual who dreamed that he swallowed a foreign body, and who had, in reality, swallowed a portion of a set of false teeth without any symptoms being produced. How often have the most serious symptoms compromised the life of the patients who were entirely unaware that they had swallowed a foreign body! As there are all kinds of foreign bodies, we must also expect to find all kinds of symptoms. Those which are unattended by immediate symptoms, will present severe ones after a certain lapse of time.

This fact being well established, should the surgeon allow himself to be guided by the symptoms? Must he believe, in the temporary absence of the latter, that the foreign body, which is said to have been swallowed, has dropped into the stomach, since it does not give rise to any symptoms? Assuredly not, for such an opinion, if it prevented a more careful examination, might be followed by the most disastrous consequences.

Among all the symptoms, the disorders of deglutition, the fixed pain

in one spot, and the suffocation, are those which furnish the best data and are least often absent.

But however useful the symptoms are when the surgeon has completed his examination by the measures which we shall now describe, they may be equally deceptive, if alone considered. We must also make a local examination.

Local Examination.—This includes:

1. The visual examination of the mouth, pharynx, and œsophagus.
2. Examination by external and internal direct touch; indirect (sounds, resonator).
3. Auscultation by Hamburger's method.

1. *Examination by sight, of the mouth, pharynx, and œsophagus.*—In order to make an examination with the aid of sight, the patient must be placed in a proper position, being seated on a chair near a window in such a manner that the light illumines the fauces. Care must be taken to throw the head backwards; the surgeon or an assistant then depresses the tongue by means of a spatula or the handle of a spoon, and directs the patient to open the mouth wide. Usually we will not succeed at first, because the position, and especially the presence of the foreign body in the pharynx, give rise to attacks of suffocation or vomiting. We must also act quickly and trust to several successive attempts. The cases in which the foreign body has been thus observed *in situ* are rarer than we would think, and this fact is explained by the restlessness of the patients, who greatly dread all interference, however mild, and who most frequently suffer from the obstruction which the swallowed body causes them.

If the individual is more patient, we may carefully examine the pharyngeal cavity, and, by making him give utterance continuously to a vowel sound, such as "a," the isthmus of the fauces is widely opened and permits exploration. But the latter, by the aid of sight alone, cannot pass beyond the pharynx. The laryngoscope has also been resorted to in the diagnosis of foreign bodies in the pharynx. It is employed as in ordinary conditions, but is only capable of giving exact information in special cases. There are some cases on record in which, thanks to the laryngoscope, the foreign bodies have been found hidden in the pharyngo-epiglottic fold. Can we not aid the eye in the same manner in determining the position of foreign bodies in the œsophagus? An instrument called the œsophagoscope, which has been very little known hitherto, may prove serviceable in some cases.

2. *Examination by internal and external direct touch.*—Touch furnishes an idea as to the position of the body and its physical properties. It shows at what distance from the buccal orifice the body is placed, where and how it is situated in the canal. It is evident that all these indications are very useful. Unfortunately, the action of direct touch which is so exact and so fertile in results, can only be employed at a very short distance from the extremity of the digestive canal. However, after an examination of the fauces, we must explore them by the touch, unless we have sound reasons for believing that the foreign body has been arrested further down. The right index finger is used for this purpose, the precaution having been first adopted of placing a cork, or a wedge of wood, between the jaws of the patient. We must perform this exploration with all the caution which the sometimes unstable condition of the swallowed body demands. How often have fish-bones and other foreign bodies been pushed from the pharynx into the œsophagus by the exploring finger!

We read in an English journal that a physician, while exploring the fauces of a very young infant, felt a hard body which broke under his finger, and proved to be a nut-shell. The object, which had been of a regular shape, had thus become irregular, and a very simple case had been converted into a very complicated one. We must, therefore, examine this region cautiously, without attempting to pass beyond the limits imposed upon the finger by its length. If the surgeon encounters an abnormal obstacle, he should endeavor to extract it immediately; but, as a rule, his finger will not suffice.

Touch is impossible when the bodies are lodged more deeply, but mediate palpation may be of great assistance even in the cervical region. There are many cases in which the foreign body projects at the lateral parts of the neck, appreciable sometimes to sight, but more often to the touch. During this examination the head is placed successively in flexion and extension. In order to explore this region properly, the tips of the fingers are allowed to slide somewhat deeply into the mastoid fossa, the larynx being alternately displaced to one side and the other. An abnormal projection in one fossa or the other, which is appreciable to the touch, may render us certain of the situation occupied by the foreign body. Unfortunately, this plan only succeeds in a small number of cases, and this is readily understood if we reflect that the site of preference is usually, as Paulet[1] has remarked, at the height of the cricoid cartilage, which is situated more deeply and prevents the lateral projection. This ring masks the foreign body and often causes a wrong diagnosis to be made.

Finally, we must resort to catheterism and to the following procedures when the bodies are lodged below the sternal notch.

3. *Examination by indirect touch.*—We must employ special instruments in order to practise catheterism; the œsophageal sound is the most widely used instrument of this kind. We may advantageously substitute for it the bougies à boule of various sizes, which are used in dilating œsophageal strictures; in case of necessity, a leaden sound may give good results. It very often happens that exploration by these means does not furnish any indication, and may even mislead the surgeon. The sound passes to one side without meeting the body, and, if the individual can eat and drink, the surgeon will be led into error.

Fig. 7.—Œsophageal bougie à boule.

The necessity for more certain measures have given rise to new agents and new instruments. What are the bodies which may thus mislead the observer? They are usually flattened objects, such as bone, metal, or coins. By utilizing the bruit of impact which Dupuytren[2] had already referred to in his oral lectures, Collin was enabled to construct a perfected explorer of great sensitiveness. It was invented some years ago, apropos of Labbé's case of ingestion of a fork. It is made of metal in order to favor the perception of the shock, and, in order to increase

[1] Soc. de chir., 1875.

[2] Leçons orales, T. III., p. 524.

the impression, it is provided with a sounding box and an acoustic tube.

To a hollow, metallic catheter à boule is fitted a metallic cylinder, which is also hollow, and which fulfils the office of a sounding box, and transmits the vibrations to the ear of the observer by means of a rubber tube. The least contact will produce an impression upon the ear. This instrument, which was presented and recommended by Duplay to the Surgical Society in 1874, has already rendered some service. Guyon, however, does not praise it unreservedly. According to him, "its power of transmitting sound is too great, and may be a hindrance in a first attempt." The sound produced by the rubbing of the fingers against the metallic tube, or its contact with the teeth, interfere with the examination, and he has found it necessary to cover the metal with an india-rubber tube, after which he could readily proceed to the examination for the foreign body A shock, which was very distinctly perceptible even to the assistants, indicated the presence of a piece of silver.

Fig. 8.—Collin's resonator for the œsophagus and stomach.

In order to be complete, this explorer should be graduated from the extremity in order to enable the extracting instrument to be used with precision. Instead of being perceived by the ear, an electrical apparatus has also been employed; but instruments of such delicate application are not often used, and do not give better information than the preceding one.

The following are the data which these instruments furnish: 1st, the determination of the presence or absence of the foreign body; 2d, a knowledge of the distance from the buccal opening at which the object is situated; 3d, up to a certain point, the character of the body and some vague ideas as to its shape; 4th, its situation with reference to the walls of the canal; 5th, its degree of mobility.

Special Means of Diagnosis.—It now remains to mention a few other minor measures, which may furnish useful information in some cases. To this group belongs the adhesive method, which is intended to give indications with regard to the position and real form of the foreign body. Unfortunately, it requires that the body be fixed and solid, conditions which are rarely realized. Furthermore, this manipulation is not entirely harmless.

An English surgeon, Valton, reports[1] that upon exploring the œsoph-

[1] The Lancet, 1871.

agus with a rubber sound, he felt the foreign body bite upon the sound; he withdrew it, and observed upon the latter some stripes. The ingested object was a portion of a set of teeth. The presence of these stripes enabled him to determine, with precision, the position of the set, and its distance from the mouth. The knowledge of this fact is interesting, and may, under certain circumstances, be of service in making an exact diagnosis.

Cheever's case, quoted by Terrier,[1] belongs to the same category. In searching for the foreign body, by means of a wire armed with a sponge at one end, the surgeon found upon it a small speck of blood, which enabled him to make a very precise diagnosis.

Buccal exploration is sometimes rendered impossible. This happened to Broca in the case of an idiot, who presented the usual symptoms of a foreign body in the œsophagus, and who obstinately refused to open his mouth. The first attempts made to explore the œsophagus through the nose were unsuccessful, the sound entering the larynx. Broca conceived the idea of introducing a sound into each nostril. The first engaged in the trachea, the second in the œsophagus. This individual had his stomach filled with whole potatoes. The foreign body was formed behind the thyroid body, of two pieces of a calf's rib. Examples of difficult exploration are not very rare. Thus the intensity of the asphyxial and nervous symptoms may not give the surgeon time to act methodically, because it then becomes necessary to treat the symptoms before being assured of the diagnosis. We must also add to all these means of diagnosis the *auscultation of the œsophagus* by Hamburger's method. This plan has been successfully employed in England in cases of organic strictures or other changes. It has not been hitherto employed for foreign bodies, and this will be an interesting point of semeiology for study.

After all that has been said, can we mistake the symptoms produced by a foreign body for those of another affection? Mistakes are less frequent now than formerly; but the knowledge of the errors made by certain physicians should lead us to distrust first impressions, and make a careful examination of all the facts. Interference or non-interference in a question so grave may be attended with fatal consequences. I have already mentioned the case of Gauthier de Claubry, in which a foreign body, being unnoticed, produced symptoms which, for a long time, were attributed to pulmonary phthisis.

In another instance, a child who had swallowed a bone was believed to have the croup; Mondière cites the case of a foreign body which remained in the œsophagus for seventeen months, and gave rise to such symptoms that the physicians treated the patient for catarrh and then for suffocative asthma. Such mistakes may recur, but a knowledge of these examples will render them rarer.

All these facts refer to foreign bodies which remained unnoticed; but there are others in which the ensemble of symptoms appear to point to the existence of a foreign body which is not present. The "Recueil de mémoires de médecine et de chirurgie militaires" contains the history of a man who had an abscess in the neighborhood of the œsophagus and trachea, pleuro-pneumonia and pericarditis. These conditions were attributed to a foreign body which was not present, though the patient experienced all its symptoms.

Finally, patients have simulated the ingestion of foreign bodies into

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[1] Terrier: Thèse de Paris, 1871.

the œsophagus in order to gain admission into civil hospitals. In 1878 a young girl, who had already resorted to this subterfuge, in order to obtain winter-quarters in the Hôtel Dieu of Paris, presented herself again at the Pitié, stating that she had swallowed a needle, and was suffering from its symptons. On account of this simulation she was readily admitted, and it was not until several days later that Verneuil suspected the fraud on the part of the girl and discharged her.

CHAPTER VII.

PROGNOSIS.

THE prognosis in foreign bodies of the pharynx and œsophagus is always grave, but it is not equally so in all cases. Its gravity increases:

1. According as the body is more irregular, larger, and firmer; because in such cases the primary symptoms are much more severe, and are sometimes so sudden that they are beyond the resources of art.

2. According as the foreign body, whatever it may be, is situated more deeply. And, in fact, we will then find that treatment and diagnosis are much less precise, and the juxtaposition of important organs renders manipulation dangerous.

3. According as the symptoms are more insidious. All other things being equal, a body which primarily produces symptoms sufficiently serious to attract the attention of the patient and surgeon will produce less serious phenomena than a body which is at first tolerated and forgotten, and which may then give rise to the most disastrous consequences. In support of this assertion it will be sufficient to state that more than one hundred cases of death have been due to the prolonged presence of a foreign body in the œsophagus.

Finally, the youthful age of the patient renders the prognosis more serious. The infant cannot explain the accident to the physician; the narrowness of the canal renders the symptoms more severe, and surgical interference is difficult and often useless.

CHAPTER VIII.

TREATMENT.

SPONTANEOUS recovery being an exceptional occurrence, the surgeon should have at his command the means necessary to relieve the symptoms. These are arranged in the three following groups:

1. Extraction.
2. Propulsion.
3. Œsophagotomy.

But apart from these methods which are applied to the foreign body itself, there is another, called palliative, which is addressed to the symp-

toms when we do not know the position of the foreign body, or when the other plans fail. I will first discuss the curative methods, beginning with extraction.

I. The Extraction of Foreign Bodies.—This very old method has for its object the withdrawal by the mouth of the foreign body lodged in the canal. The methods of extraction are very numerous, and the inventive genius of surgeons has been given free rein in order to devise, according to circumstances, different measures of extraction. Nevertheless there are some well-defined groups in the midst of so many diverse facts. While certain measures, like the use of emetics, are addressed to nature by endeavoring to produce efforts of spontaneous expulsion, others, on the contrary, like those methods in which we employ instruments, act directly upon the foreign body. Hence the natural division into

Indirect methods	Position. Emetics. Injections.
Direct methods	Extracting instruments. Instruments of all kinds.

1. Indirect Methods of Extraction.—*Position.*—Classical authors do not mention this procedure, and I would pass it by in silence, if I had not, on several occasions, found it employed by physicians or patients. It consists in placing the patient in such a position that the head is low. For this purpose we can use the edge of a bed, the body being horizontal and the head dependent. Upon one occasion a man was several times suspended by his feet, in the hope that the sou which he swallowed would drop out from its own weight. To these manipulations, the administration of blows to the back has also been added.

It is hardly necessary to say that all these ordinary measures, which are perhaps useful in bodies in the air-passages, can possess no efficacy in the cases under consideration. How could it be otherwise, since it is the property of the œsophagus to contract spasmodically upon the body and to grasp it with a force which is much greater than that of gravity. We must, therefore, reject these measures as impracticable, distressing, and useless.

Emetics.—The notion of causing persons who have swallowed a foreign body to vomit, is very natural. It has been resorted to from all times, and various means have been employed to produce it (tickling the uvula with the finger or with a feather). Physicians have preferably employed the ordinary emetics, and especially tartar emetic. But for this purpose it is necessary to introduce the emetic into the stomach, a thing which is not always possible. Surgeons have also resorted to other paths of introduction in such cases. Hévin reports that Mogniot successfully administered an enema of tobacco to a man who had swallowed a piece of sheep's lung which had engaged in the œsophagus. The remedy was very effective in this almost desperate case. Intra-venous injections of tartar emetic have been resorted to in order to arrive at the same end when the œsophagus will allow nothing to pass. The dose for injection was ten grains; Kohler,[1] being unable to push a piece of tendon onward, opened a vein,

[1] Bibliothèque du Nord, T. I.

and injected ten grains of tartar emetic; vomiting occurred a half hour later and caused the expulsion of the foreign body. Other authors (Knopf, Bégin) report similar cases of recovery.

The advantages of this measure are undeniable, and there are numerous cases which prove its usefulness. Moreover, the nature of the emetic or its method of introduction are immaterial. By the side of the ingestion and intra-venous injection of various substances we must place the hypodermic injections made with the aid of Pravaz's syringe, and the efficacy of which are so well known. Apomorphine has been recently used, but the employment of this agent requires great care. If we do not wish to use these remedies, the surgeon may imitate Habel's plan,[1] who, in a case in which a piece of meat was arrested in the œsophagus, and after fruitless efforts at propulsion, pushed a catheter past the foreign body and injected the sulphate of copper into the stomach. The vomiting cured the patient.

Despite the undeniable services which it renders, the emesis method is not free from all reproach. It is advantageous whenever the foreign body is doughy, pulpy, and rounded, and whenever it is not too irregular. But the efforts of vomiting have sometimes proven very injurious when the foreign body was irregular (pieces of bone, needles, fish-bones), because they created or increased the perforations. Even apart from this danger, the contractions of the stomach and œsophagus are very distressing, and it has happened that not alone were the foreign bodies not ejected, but that a marked aggravation of all the symptoms occurred. Créquy[2] has observed a case of this kind.

At the present time the opinions of surgeons are divided upon this question. Some do not allow the administration of emetics unless the stomach contains food, in order to avoid the empty retching which is so distressing, and usually so dangerous and useless. Others, still less in favor of emetics, do not advise their employment except the other ordinary methods have been tried, and extraction or propulsion have been attempted. Finally, some authors entirely discard the use of emetics. They blame this plan with adding to the already serious symptoms, caused by the presence of the foreign body, a very distressing morbid condition which continually increases the symptoms in all cases, and sometimes prostrates the patients and paralyzes their energies for a very long time, and deprives them of the courage to submit to measures of another character. Patients who were exhausted by the efforts of empty retching, and suffocated by the foreign body, have been known to refuse all assistance, and to feign recovery, preferring their endurable suffering to that produced by the spasms of vomiting. Gensoul especially dreaded a rupture of the stomach from the contractile efforts of this organ. This is a visionary fear, which is never realized, and it would be more rational to expect a wound of the diaphragm than one of the stomach.

However this may be, we must employ emetics with great caution, and, if they do not prove successful in the beginning, they should not be repeated. Nor do I consider it prudent to follow the example of the English physician, who administered an emetic for three days, morning and evening, until a coin was ejected.[3]

If the patient is an infant, or an individual who has swallowed a soft substance, like meat, there is no better plan than the use of emetics; but

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[1] Langenbeck's Archiv, 1862. [2] Gaz. hebdomadaire, 1865.
[3] The Lancet, T. I., p. 189.

if it is hard and irregular, we should abstain from its employment, and only resort to this plan after other measures have failed.

The substance employed, or the mechanical measures adopted, depend upon the inclination of the surgeon.

Coughing.—Sneezing.—It often happens that persons who have swallowed a foreign body experience respiratory symptoms rather than those on the part of the œsophagus; they swallow readily or with slight difficulty, but respiration is impeded. The extremely violent efforts at coughing which these patients make only lead to a good result when the foreign body is arrested below the upper orifice of the pharynx. This is not true when the body is situated in the vicinity of the isthmus, and in this case the object is displaced by the violent expulsion of the column of air.

However, Bégin cites some cases which he regards as proof of the efficacy of coughing.

Observation.—Bégin reports the case of a man who had swallowed a piece of the rib of a partridge, and was seized with a convulsive cough and repeated attacks of vomiting. For some time the patient was a prey to great agitation. The symptoms appeared to subside, but reappeared with renewed intensity. There was no difficulty in deglutition, but merely a dry, hacking, frequent cough, anorexia, and emaciation. The foreign body was expelled after a certain length of time, in the midst of a coughing spell.

In the main the production of cough is a poor measure, and the same may be said of sneezing, which has fallen into disuse or has been banished from popular empirical measures. It is addressed to an eminently irritable, but also very slightly resisting organ, which, by forcibly contracting upon the irregularities of the foreign body, may give rise to a perforation.

2. Direct Extraction.—Direct extraction is the most rational of all methods of treatment. Before studying its value and the indications which it answers, I will pass in review all the various groups of instruments which are at our command. Hévin divided these instruments into four groups: 1, forceps; 2, hooks; 3, rings; 4, fixed sponges.

Since Hévin's time, our armamentarium has increased very much, and it would be almost impossible to trace the history of all the instruments which have been invented. However, all belong to one of the four preceding groups, especially if we regard them from a less strictly scientific point of view. Some are prehensors, and act directly upon the foreign body without being under the necessity of passing beyond the point at which it is arrested. The hooks and rings act from below upward, carrying the body along with them; but their action necessitates their introduction beyond the obstacle.

Finally, the sponges, etc., act in the same manner, and also by dilating the œsophageal canal above or below the foreign body. Hence the more rational division of extracting instruments into:

1. Prehensors; 2. Conductors; 3. Dilators.

1. Prehensors.—Forceps.—The fingers constitute the most simple forceps; but their action is rarely possible, and it cannot be exercised beyond the upper part of the œsophagus. Dupuytren has succeeded in withdrawing foreign bodies from the pharynx, by introducing the fingers deep into the pharynx and pricking the body into the pulp of the finger. He then withdrew it. A. Desprès has obtained good effects from the same measure, but I would not advise its employment, as it appears to me that, in order to be successful, pressure must be made upon the body, and that the latter has a greater tendency to produce perforation of the wall of the pharynx than of the finger.

Sometimes the progression of the body from below upward, produced by external manipulations of the neck, has permitted the fingers to be employed in its extraction.

Observation.—Walker, in a case in which a coin had been swallowed, had recourse to the following manipulations: As he could feel the foreign body very distinctly with the fingers placed upon the middle of the neck, he chloroformed the child, and made the coin move upward by means of the thumb and fingers, until its edge appeared in the pharynx. He then seized the sou with two fingers, and turned the head in such a manner that the coin fell into the mouth; the metal had become slightly corroded during the twelve days of its arrest.

Observation.—Delamotte (quoted by Hévin) had under his care a young girl who had swallowed a half-crown, which was vigorously grasped at the back of the fauces; having been unable to extract it or push it onward, he displaced it and withdrew it with the fingers. The jaw-bone of a pike was extracted in a similar manner from the fauces of a footman.

For want of something better, we may resort to this plan, but we should not delude ourselves with regard to the certainty of the measure.

All forceps which are long and narrow have been and may be employ-

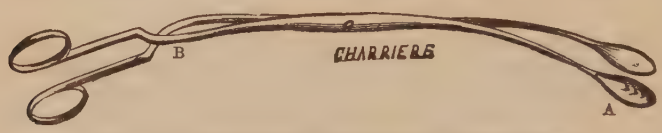

Fig. 9.—Curved forceps for the extraction of foreign bodies.

ed for the extraction of foreign bodies. The most common ones are the ordinary dressing forceps, polypus forceps, forceps with sheaths and with two or three blades (Hunter, Cooper). These straight forceps are only serviceable when the foreign body is lodged in the pharynx. In order to employ them, we must illuminate the fauces properly, and introduce them directly or upon a finger serving as a guide, after having adopted the precaution of keeping the jaws separated.

Cloquet's forceps.—Forceps have been used both with a stop and

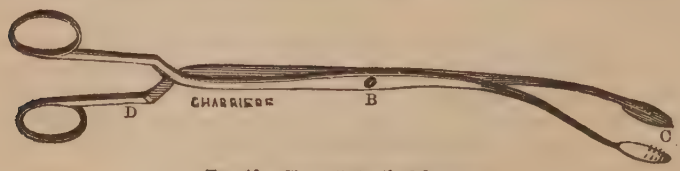

Fig. 10.—Cloquet's toothed forceps.

with teeth or points. Cloquet's forceps fulfils both these indications; this surgeon, having failed in a case in which he had used all kinds of ordinary forceps, conceived the idea of constructing a curved forceps, adapted to the differences in the curve of the tube. The bit may be opened in the transverse direction, which is that in which the œsophagus is most easily dilated. He endeavored to obtain, at the same time, a sufficient separation to seize the body, and not to nip the mucous membrane. Upon the inner surface of the edges he had made a series of hooks curved backward and situated upon the median line. This forceps has rarely been used, though it is to be recommended, and will enable bodies to be seized

which are lodged as low down as the cardia. We may object to this instrument that it opens in the direction most unfavorable to prehension, especially when the bodies are flat and regular.

Collin's forceps.—But this inconvenience can be remedied by employing Cuzco's forceps, modified for this purpose by Collin. This forceps possesses the advantage of acting immediately upon the foreign body, as it is not necessary to pass beyond it. It is composed of two blades joined at a few centimetres from the rings. This joint acts at a distance by means of an intermediate piece, which transforms the movement of separation into one of propulsion of one blade upon the other. The middle portion of the instrument is composed of two blades, one of which, the male, glides in a groove of the female blade. The extrem-

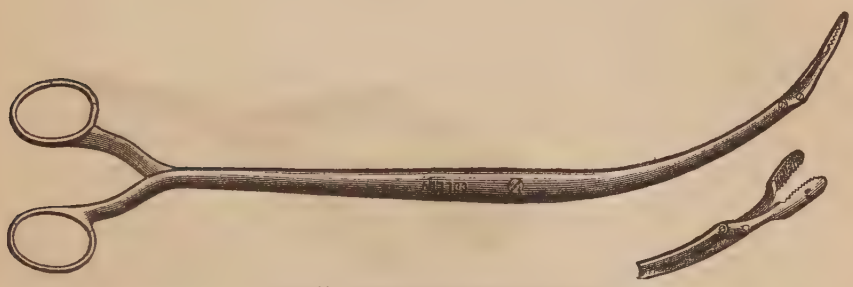

FIG. 11.—Collin's forceps with movable lever.

ity is formed by the two blades of a forceps with flat teeth. One of these blades is only movable around a fixed point on the female branch. In consequence of an ingenious mechanism, the forceps can be opened by separating the outer rings. The instrument has a very defective curve, which only renders it applicable to the upper part of the œsophagus, because it does not correspond to the curvature of the cervical portion of the canal. Another objection against it is the fact that it only acts in an antero-posterior direction, a circumstance which is only favorable for flat objects.

One precaution must be taken in using this instrument. When the body is felt, the teeth of the forceps must be opened, then slightly pushed together, in order that it may be seized more readily. I believe that the inconveniences of Collin's forceps may be avoided by adopting the following change: the female blade should be of whalebone and carry a whalebone or metallic valve at the end. The male blade should be of brass wire, secured by rings separated ten centimetres, and should act, like Cuzco's forceps, upon a very movable valve by means of a lever. We would thus have all the curves desirable, and could direct the instrument at will in one direction or the other.

Burge's forceps.—This instrument is used in England and America. It is as large as an ordinary sound, has very long curved blades, and is jointed at a right angle only a few centimetres from the rings. The slightest separation of the rings is accompanied by a separation of the instrument at the other end sufficient to extract large bodies. Gaujot and Spilmann object to the exact closure of the instrument, as it exposes the mucous membrane to the liability of being nipped. A slight modification would remedy this defect, and would render the instrument very useful.

Mathieu's jointed forceps.—Mathieu's forceps, formed of jointed and crossed pieces which open along a series of lozenges, is an extremely ingenious, but also useless instrument. As suggested by Ollier, it was terminated by teeth with perforated cups in order to extract a bullet. The first blades, which are soldered to the rings that support the pressure, should be very strong.

Gama's forceps.—Gama had invented an instrument which permitted

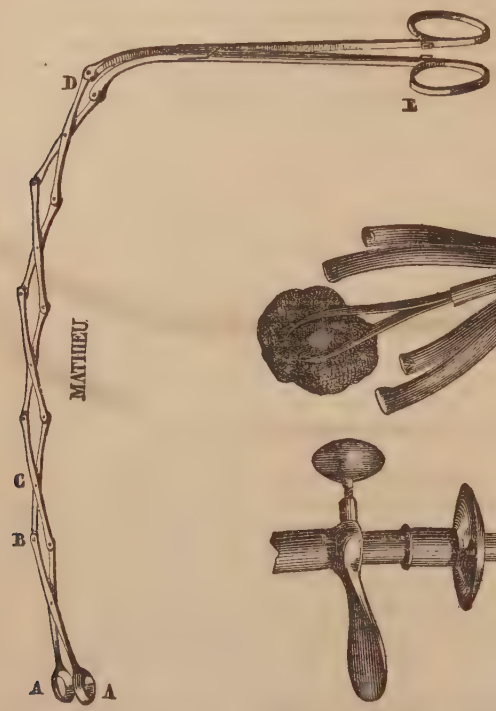

Fig 12.—Mathieu's jointed forceps.

Fig. 13.—Gama's forceps (after Bougery and Jacob).

dilatation of the œsophagus and seizure of the foreign body at the same time. A forceps with four branches is contained in a hollow sound. Within this first system there is a sound containing a double-toothed forceps in its interior. The instrument is manipulated in the following manner: it is introduced closed until it meets the foreign body. We push forward the first forceps with four branches, which dilates the œsophagus at this point, and then the inner piece, whose object it is to grasp the foreign body. This very complicated forceps is rarely used, but it may prove serviceable in able hands. It is an imitation of the forceps invented by Alphonsin de Ferry.

Bryant's revolving pharyngeal forceps is merely a slightly modified reproduction of Gama's forceps. However, it possesses the advantage that it may be opened in all directions, like Collin's revolving extractor.

Gendron's crane's bill forceps (enclosed in a canula), *Missoux's geranorhynque*, and *Doussault's dilating key* are similar to the preceding, but are not used at the present time. Gensoul, after having vainly endeavored to extract a large and pointed piece of bone, which had

engaged with both ends in the walls of the canal, was unable to withdraw it except by forcibly dilating the region with a dilating forceps while he disengaged one of the ends with another pair.

Finally, we must also refer to the utility of disjointed polypus forceps, which readily permit the body to be seized in some cases when it is somewhat large. Thus, Michon ingeniously overcame the difficulties experienced in a case in which a large horse-chestnut was lodged in the lower part of the pharynx. The forceps were disjointed, introduced as blades of the forceps, and then jointed; extraction was readily performed.

I do not regard those instruments which seize the body not transversely, but vertically, after having grasped the obstacle with one of the teeth, as belonging to the class of prehensors. They are conductors rather than prehensors.

Hooked Instruments.—*Fabrice of Hilden's hook.*—The oldest known hook is that of Fabrice of Hilden; it is almost rudimentary, is composed of a plate of steel, enlarged at the end in the form of a scraper. The ability of the surgeon must supplement the imperfections of the instrument. Fabrice was fortunate enough to extract a thick bone of a triangular shape by means of this instrument, and Rivière withdrew a bone which was situated deeply and surrounded by soft parts. It has also served to extract a pin, a bone, and a codfish bone (Hévin). Dipper-hooks and curved wires will serve the same purpose.

Stedman's hook.[1]—This is a hook, the handle of which is surmounted by a small double metallic button. It is only exceptionally used, as it is not easily handled. Stedman himself stated that he was obliged to introduce it fifteen times before he was able to seize a bone which was lodged low down. Bégin used a similar hook made of silver.

J. L. Petit's hook.—J. L. Petit employed a very strong silver wire, which he bent at the end and rolled in a spiral up to two fingers' breadth from the end. A ring is thus formed, which, being curved back, constitutes a hook.

Fig. 14.—J. L. Petit's hook.

Kuehne's hook[2] is very similar to the preceding, and served him in extracting a five-franc piece. It is still more primitive, and may prove useful on the field of battle.

Graefe's basket, modified by Dupuytren and Charrière.—Among all the hooks, the only one which has remained classical is the jointed basket known as Graefe's basket, though this term is improper, for it contains very little of the original instrument of this surgeon, which consisted of a metallic wire provided with a double hook at the lower end. For a certain length of time surgeons employed it with success. It was first modified by the authors, who increased the number of hooks. Dupuytren devised the basket joined to the œsophageal wire, which permitted him to seize the body with greater certainty, and he hollowed out the surfaces of this small cup; this hook was also very much used. It enables us to extract a very large number of foreign bodies, and is spoken of abroad under the term Dupuytren's prehensile œsophageal sound.

Charrière made the apparatus even more useful by articulating the basket with the wire, by means of a small transverse bar. Dupuytren employed it as early as 1832, and succeeded in extracting a five-franc

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[1] Trans. of Edinbugh Med. Society. [2] Gaz. médicale, fév., 1857.

piece. Since that time it has been more employed than all other instruments, and counts the largest number of successes. It has been especially useful in the extraction of coins, pieces of bone, false teeth, a small silver cross, etc.

But Graefe's basket presents a certain number of inconveniences. In the first place, it is not always easy or possible to make it pass beyond the obstacle, and by using force we run the risk of wounding the walls of the canal. On the other hand, it does not fix the foreign body sufficiently, and the latter may see-saw and rock in any position, and very often at the level of the larynx. Richet, having failed to withdraw a coin with Graefe's basket, investigated the cause upon the cadaver, and found that the coin turned in one of the cups. He then constructed larger rings, but their introduction became difficult and extraction dangerous. It may happen, in fact, that the basket, in returning, grapples with a resisting object, which the surgeon supposes to be the foreign body, but which is in reality the lower border of the cricoid cartilage.

Denucé's instruments.—Denucé has strongly insisted upon all these inconveniences, and, in a case in which he was unable to extract a pigeon-

FIG. 15.—1 and 2, Denucé's instruments. 3, Modified Graefe's basket.

bone with this instrument, he devised several excellent modifications. The simplest and best consists in slipping a hollow tin sound upon the whalebone. The sound, when pressed upon the grasped body, holds it and facilitates extraction. In another modification, the inner wire and the sound each carry a small hook, which, by being clamped, seizes the foreign body as if between the teeth of a forceps. The latter instrument enabled Denucé to withdraw the body in question. It may also be objected that this instrument closes completely, allows nipping of the mucous membrane, and necessitates a previous exploration, which will enable us to determine in which direction the hook must be pushed.

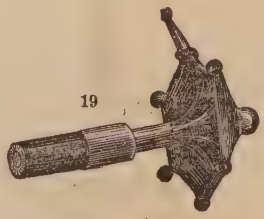
Parent's extractor.—Parent invented a hook which is a modification of J. L. Petit's, and which has been used to advantage. A rounded and flexible whalebone, thirty-six to forty centimetres long, and slightly

curved, carries a large ring at one end. The other carries a movable hinged hook, which is opened by a spring, and which can be closed at will, by a very strong wire attached to its extremity. This apparatus is contained in an elastic rubber canula, open at both ends. In order to use it, we introduce: 1st, the catheter below the body; 2d, the hook which is made to pass it, and which is opened by the action of the spring. Finally, the canula is pushed upon the hook in order to keep it open, and we then extract it by grappling the foreign body. If this does not succeed, we can close the apparatus in situ.

Collin's lever extractor.—Collin has very recently invented a new extractor, which appears to be preferable to all the preceding ones. "It consists of a flexible sound, at the extremity of which is a metallic plate, the plane of which, at the moment of introduction, is in the axis of the sound. When the foreign body—a coin, for example—is seized, the plate revolves upon itself, and may, at the same time, revolve in all directions. It is engaged below the lower border of the foreign body, and, when the sound is withdrawn, it carries the latter along with it." This extremely ingenious instrument is the most perfect type of conductor, and is of undoubted service.

To the group of hooks belong the instruments with little wings, or a sort of small umbrellas, which are introduced closed, are opened when the foreign body has been

Fig. 16.—Collin's revolving extractor.



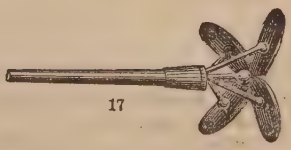


Fig. 17.—Gross's instrument, open. Fig. 18.—The same covered with bristles. Fig. 19.—Bauden's parasol, open.

passed, and are withdrawn open. I will not describe each of these small umbrellas, which are more curious than useful. One of the simplest is that invented by S. Gross. It consists of a steel tube, fifteen inches long, traversed by a mandrel surmounted by four small wings, which are extended or lowered by a simple movement of rotation impressed upon the handle of the instrument.

As early as 1803 Rivière had invented a sort of parasol, which enabled

him to extract a very large bone. Baudens conceived the same idea, and constructed a small umbrella covered with silk, and which could only be opened after the foreign body was grasped. In a similar manner S. Gross's instrument has more recently been covered by filling in the spaces between the wings with hog's bristles, so as to form a sort of cover, capable of retaining small, pointed objects. It is well to be familiar with these instruments, as they may be of service in special cases, and guide the surgeon in making continual improvements.

Rings.—Considerable use was made, in the last century, of instruments called rings, formed by metallic or other handles. This category includes J. L. Petit's ringed sound, which consists of a whalebone or flexible silver wire, to the end of which is attached a collection of rings, which may be moved in different directions and present various surfaces to the œsophagus. This instrument was of service in the hands of the inventor, but he only succeeded in the fifth attempt. It has been modified advanta-

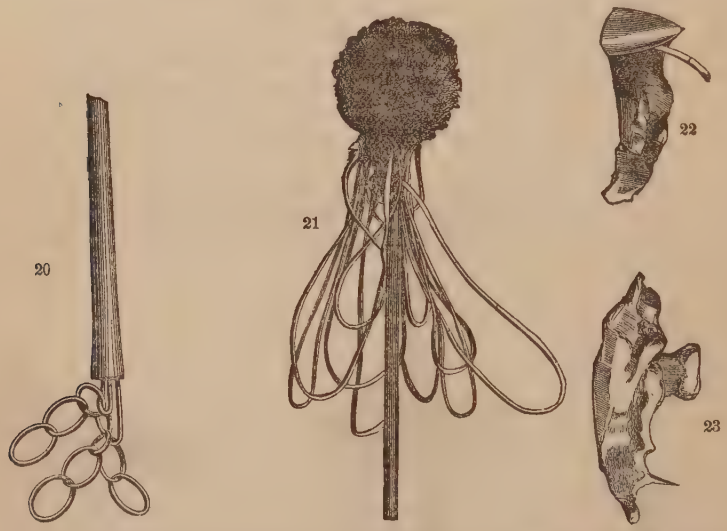


Fig. 20.—J. L. Petit's ringed instrument. Fig. 21.—Dearden's instrument. Figs. 22 and 23.—Facsimile of a piece of a dental plate removed by the aid of this instrument (from the Lancet, 1869).

geously, and vertical metallic rings have been substituted in the first part, and horizontal ones in the second; the rings are useful when the foreign bodies are not large.

Within recent times, Dearden[1] invented a new instrument composed in part of loops of hair or hog's bristles. These tufts, being carried by a whalebone below the foreign body, grapple it when they are withdrawn. Torry Cooper speaks in favor of the apparatus; it is at the same time a dilator, owing to a sponge which is placed below the loops, and a ringed extractor on account of the latter.

3. Dilators.—*Sponges and allied instruments.*—Small sponges have been used for extraction for a very long period, even Fabrice of Hilden having employed them. La Faye used tow attached to the end of a flexible sound. Hévin mentions this procedure, and, struck by its incon-

[1] Lancet, 1869.

veniences, proposed to modify it in order to permit the sponge to pass beyond the foreign body. "It would be well," he says, "to inclose it in such a manner that it can be kept in a very small compass, and to free it after it has passed beyond the foreign body." New sponge is covered with a silk ribbon, which is withdrawn after the foreign body has been passed; we can thus extract pins, needles, and pieces of bone.

Bonfils introduced the compressed or elongated sponge at the end of a mandrel in a flexible sound, and did not disengage it until it had passed the body. There are a large number of observations in literature in which recovery has occurred from the use of the sponge. One of them has become classical and is mentioned by Boileau.[1]

Observation.—An individual, who had swallowed a five-centime coin, was treated by a physician, who tried in vain to withdraw it, and then to push it into the stomach. Boileau, being called, found the patient suffering from violent vomiting, and complaining of an acute substernal pain. After having discovered the foreign body, he took a whalebone pierced with holes, which he pushed into a cone of sponge which had been tied with twine for an hour. At the end of this time, the sponge, being reduced to the volume of an olive, was greased and introduced, though not without difficulty, below the foreign body and into the stomach. It was withdrawn shortly afterward, a resistance was felt in the neck, and the foreign body was carried into the mouth in front of the sponge.

Another fact of this kind is reported by A. Thierry,[2] and I quote from this author the description of the instrument which he used. "It is composed of a long œsophageal sound, terminating in a silver bulb. This bulb is hollow, and forms a box which may be divided into two parts: one, which remains adherent to the sound; the other, which is lowered by pushing a wire passing through the sound. The lower half contains a piece of dry, compressed sponge, which is firmly fixed. We begin by making the entire bulb pass below the foreign body; the two halves of the box are then separated. The sponge being thus laid bare, water is injected into the sound." The enlarged sponge acts as a ramrod, sweeping the œsophagus from below upward, and may carry the body along with it. Thierry succeeded with this instrument in extracting a bone from the œsophagus of a nun, and a pin in a young man.

We can employ similar measures to advantage by modifying the articulation of Thierry's cups, opening them with hinges at the lower part, in which the conducting wire is also fixed. The cup containing the sponge is opened, and allows it to pass. Heister and Wedel furnished the tip of the whalebone with a tuft of hog's bristles. The "provender" of English surgeons merely consists of this tuft, composed of hair, bits of thread, small ribbons carried on a flexible piece of whalebone, iron or brass wire.

Ollenroth's instrument, similar to the sponge, is composed of a stem formed of bulbs of tin, at the extremity of which is placed a sponge; this instrument is very flexible, but may break.

In Brouillard's instrument, the sponge introduced at the end of a leaden sound was governed by two wires, one external, the other internal.

The horse-hair probang.—Among the number of instruments founded upon the same principles, dilatation and extraction, I will mention the ramrod œsophageal sound, in which we also find a compressed sponge attached to the end of a sound which moves in a canula. The

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[1] Arch. gén. de méd., 1829, p 120. [2] Moniteur des hôpitaux, 1856.

wire and canula are bound together by very strong horse hairs, which, by the movements of the canula, are applied against the wire where they separate into a circular fan. This instrument has been successful in extracting pins, needles, etc.

Mechanical dilators.—These instruments are intended to dilate the œsophagus below or even above the foreign body, so as to disengage the foreign body and render it movable. For this purpose Oury invented a sound at the end of which was a vessel, which he inflated with air when it had passed beyond the foreign body. In a memoir, presented to the Academy of Sciences in 1838, Béniqué extolled the same measure, not alone for the œsophagus, but also for the urethra. His instrument is an elastic sound, the diameter of which is about two or three millimetres. Two or three centimetres from the end is a bladder of gold-beater's skin ; when empty, its volume is not greater than that of the sound ; when dilated, it forms a cylinder from two to three centimetres in diameter. A mandrel gives to the sound the resistance necessary for its introduction. When the foreign body has been passed, the little bladder is injected, and forms an obstacle behind it which fills the lumen of the œsophagus. This is not all ; above the foreign body he introduced another bladder of larger dimensions than the one in the œsophagus, and filled it with water. Extraction is performed by varying the dimensions of the latter bladder according to circumstances. The objection to this instrument is that it permits rupture of the lower bladder. Béniqué foresaw the objection, but he thought that this accident would be very rare, and that its frequency could, moreover, be diminished by increasing the thickness of the gold-beater's skin. Finally, he insisted strongly upon the tendency of the foreign body to lodge along the length of the sound between both bladders.

Modern authors do not mention these attempts at extraction after dilatation. I do not know whether this instrument has been employed, but the method, at least, merits consideration. The instrument may be improved by adding, for example, to the lower bladder (which should be filled with air, and not with water) a cup, which closes while passing down and opens in coming up.

Gautier, of Geneva, succeeded in 1875 in extracting a bone from the œsophagus, by the aid of Gariel's air-pessary.

Manner of Performing Extraction.—The first question which arises is whether the patient must be anæsthetized. This was answered in the affirmative, in 1875, by Giraldès, before the Surgical Society of Paris. I am unaware, from the published cases, whether chloroform has been often employed. However, despite the apparent utility of diminishing the contraction of the œsophagus during extraction, this is not always so effective as we would think. In fact, a large portion of the muscular fibres of the œsophagus are under the control of the pneumogastric nerve, and the anæsthesia must be pushed very far in order to paralyze its action. Furthermore, we lose the useful information which the patient may furnish, and, on the other hand, manipulation is rendered more difficult by the involuntary closure of the mouth. Anæsthesia during extraction, which is usually performed while the patient is seated, presents serious inconveniences ; extraction in dorsal decubitus is possible in case of necessity, but the manipulations are rendered more difficult.

Extraction should always be preceded by a careful exploration, consequently by catheterism, which furnishes the necessary data with regard to the position of the body.

If the patient is not anæsthetized, as is usually done, he is made to sit upon a chair, the head thrown back and firmly braced against the chest of an assistant, who supports him from the sides with his hands. According to Marjolin, extraction is rendered difficult by the omission of an important precaution, which consists in rendering the patients entirely immovable by means of a cloth wrapped around the chest and upper limbs, and in keeping the jaws separated by means of a cork. These preliminaries are especially necessary in children and ungovernable individuals. The tongue is then depressed with the left index finger or preferably with a spatula, which serves as a conductor for the extracting instrument, previously greased or oiled, and introduced with the right hand.

During this time the surgeon should stand up between the patient's legs or a little to one side. Several attempts must almost always be made to seize the foreign body, and, as the manipulations are distressing to the patient, they should be made with the greatest gentleness.

We must not forget that it is very advantageous to use graduated instruments, and that the distance which separates the edges of the foreign body should be carefully determined. This precaution is especially important if the extractors pass beyond the foreign body.

After the body is grasped, the operation is not finished, and the last stage, which includes the extraction properly speaking, presents great difficulties, and may even give rise to serious complications. The escape of the body is the most frequent of all the accidents which may happen. How often does the instrument slip and go astray, and the hook, forceps, or basket, is found empty! We must, therefore, be patient and gentle, and avoid pulling too strongly when we encounter an obstacle. When an angle of the body has perforated the wall of the œsophagus, tractions may become very dangerous, and we must then avoid the employment of force, because the resistance can only be overcome at the cost of serious lesions. Bégin mentions a striking illustration of this statement.

Observation.—A soldier, while eating his soup, swallowed a bone, which lodged in the first part of the œsophagus. On the following day Bégin endeavored to extract it. A blunt silver hook upon a cylindrical wire was only passed after several trials, and when it was withdrawn, after having given it a suitable direction, it grasped the bone with force. But the foreign body was so firmly imbedded that the blunt hook became straightened during the traction and was restored by leaving it in place. Long curved forceps carried up to the bone, grasped it after several attempts, without being able to disengage or extract it. Portions of it remained between the forks of the instrument, and the branches of the latter were warped several times, despite their solidity, and although not the least change could be produced in the situation.

These inconveniences are less rare than we would imagine, and it often happens that the surgeon is able neither to extract the body nor the basket placed below it. It would be wise in such a case to introduce an air, water, or mechanical dilator, as far as the foreign body; in many cases this will enable us to withdraw the foreign body at the same time with the instrument. This is a mild measure; but if it fails, nothing remains in the cervical region except œsophagotomy.

It is evident *à priori* that conducting instruments are much more liable than others to produce this disastrous accident, and by acting *à tergo*, they are more difficult to withdraw. Graefe's basket, among others, has been the cause of a considerable number of accidents, some of which have terminated in death.

Observation.—In Demarquay's case, reported by Créquy, emphysema, tumefaction, and fever developed after repeated efforts at extraction with Graefe's basket. Death, six months later, from marasmus and inanition. The coin was found at the bottom of a large collection of pus, which extended from the fifth dorsal vertebræ to the basilar process, and communicated with the pharynx. (Gaz. hebdom., 1861.)

If such cases are exceptional, examples of localized œsophagitis are very common, and, without fear of contradiction, I might almost state that there are no cases of extraction without some lesions of the mucous membrane.

It would be an error to believe that the task is done after the instrument has entered the œsophagus as far as the foreign body. Two dangers must be avoided: on the one hand, the escape of the body into the air-passages, and, on the other, its relapse into the œsophagus. Literature presents several examples of both varieties, and Walton mentions a case in which a set of teeth, being withdrawn as far as the pharynx, fell back again and was swallowed. A certain amount of caution, and especially the direction of the attention of the surgeon to a knowledge of these facts, will prevent the occurrence of such accidents.

Propulsion.—The object of propulsion is to push foreign bodies, which have accidentally lodged in the œsophagus, into the stomach. This presents itself as the most natural means of removing an obstacle to the progress of alimentary matters, and as an expedient in cases of bodies which are situated abnormally in the œsophagus.

Foreign bodies can be pushed into the stomach in three different ways:

1. By means of solid or fluid alimentary substances, which produce active movements of deglutition.

2. By manipulations of the foreign body, which, by crushing and breaking its substance, deform it and permit its deglutition.

3. By means of instruments or various objects, which are pushed through the pharynx and œsophagus.

1. Propulsion with Alimentary Substances.—This group comprises a multitude of petty popular recipes, consisting in the deglutition of large and compact alimentary boluses, which, by slowly dilating the pharynx and œsophagus, may push small, movable bodies before them. I will mention, among others, the crust of bread, half chewed, without drinking, dry figs, prunes without pits, pieces of boiled beef. Stalks of lettuce and pieces of turnip have been eaten for the same purpose. It is hardly necessary to insist upon all these measures, which may be very serviceable in practice, not alone as propulsors, but also on account of the information which their more or less difficult or impossible deglutition may furnish.

Water has been very often administered, and the patients have been made to swallow large draughts in rapid succession. In case of necessity it would be plausible to attempt injections of water, or Seltzer water, into the œsophagus, through strong canulæ. If the body is not pushed into the stomach, it may, perhaps, be ejected by a spell of vomiting. All these measures have met with numerous successes, though authors do not mention many cases which they regard as simple in character; but, in order that they be effective, the foreign body must be small and regular. Pieces of oyster or egg shells, nuts, dry pills, etc., have been pushed into the stomach in this manner.

In addition to these various procedures, which are of very ancient date, many think it necessary and useful to add violent blows upon the back

with the palm of the hand. Ambroise Paré never omitted it, and the practice has been carried down to the present time. I can hardly understand the usefulness of such violence, and it probably persists on account of the analogy of the symptoms with those produced by bodies which have penetrated into the air-passages.

2. Comminution.—I will be brief with regard to this second method; it consists in seizing the foreign body between the fingers, through the integuments of the cervical region, and in compressing it. This plan, which has succeeded in some cases, demands, as a preliminary condition, a knowledge of the nature of the body. Otherwise the practice would be very irrational and dangerous. This condition, therefore, restricts the application of this measure to a few cases, in which a person has swallowed very hard apples or pears, baked potatoes, and other vegetables, or boiled chestnuts. Dupuytren succeeded, in this manner, in breaking up and forcing into the stomach a rather large potato which an individual had swallowed.

Side by side with such cases, we must place those in which segmentation is performed by means of sounds or instruments, introduced through the mouth until they come in contact with the foreign body.

3. Propelling Instruments.—The third group includes all propelling instruments. The simplest of all is undoubtedly the ordinary œsophageal sound, or Dupuytren's exploring sound. However, the inefficiency of this instrument, in a large number of cases, has been recognized from an early period. In reading the thousands of published cases, we are convinced of the fact that very often this instrument does not come in contact with the foreign body. This is especially true when the foreign bodies are fish-bones or coins, which hide their presence by lying close to the wall.

I will only mention, for the sake of completeness, the waxen bougies, the pieces of stems of plants, the lead sounds, the whip-handles, etc., which were employed by the older surgeons in exceptional cases. Moreover, the number of accidents attributed to them is not inconsiderable, and are only excused by necessity, or the impossibility of acting promptly in other ways.

There is an instrument which has often proven serviceable in such cases; I refer to the stem of a leek. It can almost always be obtained, and its introduction is not hurtful to the œsophagus. The remedy is so simple that patients have often performed propulsion upon themselves in the absence of medical aid. It must be carefully kept for urgent cases, care being taken to cut off the bulb and oil the stem before introducing it. There are no examples on record of accidents caused by its use, and if the resistance which it encounters is too strong, it will yield slightly of itself.

The sponge mounted upon a whalebone, which is found at the end of Graefe's basket, is one of the best and most frequently employed propellers. It is formed of a small bulb of prepared sponge, firmly fastened to the whalebone or to an ordinary catheter. The sponge, which is found at the end of the ramrod œsophageal sound, acts rather as a propeller than extractor. The latter instruments, which are capable of being enlarged, have the advantage over the preceding, that they always encounter the foreign body, act more surely, and are able to reach even into the lowermost parts, a thing which cannot be said of the stem of the leek.

These are the instruments which the surgeon, who wishes to perform propulsion, has at his disposal. It remains for me to give a few hints with regard to their employment. They must be introduced oiled, the

finger serving as a conductor as far as the back of the mouth, and must be pushed much more slowly the nearer we approach the region occupied by the foreign body. The pressure should be gentle when resistance is felt, and must be arrested when the latter becomes too great. If the body is movable, it often happens that it suddenly tumbles into the stomach, but it is often arrested above the cardiac orifice. Hence the necessity of pushing the propeller even into the stomach. The instrument is then withdrawn with the same precautions as in entering, in order to avoid irritation of the canal, and especially in order to be certain that the body does not remain in the canal. How often has the surgeon believed that he has pushed an object into the stomach which was applied against the œsophageal wall or had perforated it! The best means of assuring ourselves as to the condition of things, is to withdraw the instrument gently and examine it. The presence of spots of blood is a valuable indication, as it indicates, either that the body is buried in the wall, or that the manipulations have succeeded in producing an erosion or perforation of the œsophagus.

The patient should also experience an immediate relief after the operation, and should swallow fluids, and even semi-solids without any great difficulty. If the surgeon is still doubtful, he should begin again, at first with an exploring sound, and then with the propeller, allowing a certain interval to elapse between each operation.

Can we be certain, in all cases, that the foreign body has fallen into the stomach? I must answer in the negative. The propeller very often acts blindly, and the surgeon and patient, reassured by a gradual and temporary improvement, soon find the symptoms reappear.

We must also adopt another precaution if we decide to use the propeller, viz.: to be certain that the sponge or analogous body, which is fixed to the extremity of the sound, is firmly adherent. It is necessary to guard against detaching it, as has happened to several practitioners. The following case, which I copy from the records of the last century, will serve as an example:

Observation.—A young man had swallowed a piece of meat, which was arrested in the first part of the œsophagus. A surgeon, who was summoned, could think of no other means than pushing it forward with a stick, the end of which he covered with a small piece of linen; but his efforts were in vain, and he was obliged to withdraw the stick, from which the linen was detached. Very fortunately, the administration of an emetic produced entire recovery. (Observ. de méd. des hôp. milit., 1772.)

In discussing the advantages and indications of each method, I will show to what grave symptoms forced propulsion sometimes gives rise. But, before leaving this subject, we must add that it has several times occurred that, in attempting to push a foreign body, the latter has been lodged in the leek or sponge. We must not rely upon the occurrence of this fortunate accident, but when it takes place, it cuts short all uneasiness. Among other cases, Torry Cooper saw a patient who had swallowed a pike-bone; the bone became imbedded in the sponge of the propeller.

ŒSOPHAGOTOMY.—Œsophagotomy constitutes the third great method of treatment. Its history is much more recent, but, for some years—thanks to the investigations of Terrier[1]—it has entered into surgical practice.

The object of this operation is to lay bare the foreign body through

[1] Terrier (Thèse de Paris, 1871).

the integuments of the neck. It therefore necessitates section of the skin, the aponeuroses, and the walls of the œsophageal canal, which support traumatisms better than we would otherwise believe, judging from our unfortunate prejudices. However, we must not exaggerate the advantages to be derived from this method, since, though it was devised two centuries ago by Verduc (1643), it has not yet been performed more than forty times in France and abroad. For a century, œsophagotomy was spoken of in the works of authors as a last hazardous and difficult resort, which they timidly proposed, without ever performing. Hévin speaks of it in this manner; but, in 1757, Guattani, taking up this idea, stated the question anew, and gave the indications for the operation more clearly.

The first two œsophagotomies date from this period, and were performed by Goursaud and Roland for the purpose of extracting foreign bodies; their success was complete. Unfortunately, there are no closer details concerning these two authentic cases. Nevertheless the idea had been projected, and had been successfully carried out.

However, it was not until 1831 that we find Bégin again performing this operation, for, despite its fortunate beginning, œsophagotomy had not been practised during the eighteenth century. If the writers mention it, it was most frequently done in depreciation. In the beginning they only permitted the operation if the foreign body projected sharply. Others, like Eckoldt, who conceived the incision between the two heads of the sterno-cleido-mastoid muscle, endeavored to perfect the operative method without applying it. Thus Chopart and Desault advised the straight operation; Penel, the use of a firm sound; Vignardonne, the use of frère Côme's sound. In fine, up to 1820, the period at which Vacca's work appeared, the debate was idle, as no one decided to perform the operation. It had found partisans in the old Academy of Surgery, and even others, like Bell, Richter, and Delpech; but, on the other hand, it failed to obtain the support of Chopart, Desault, Sabatier, and Boyer.

In his memoir of 1820, Vacca frankly accepted œsophagotomy for foreign bodies in the œsophagus, and, in addition, proposed an instrument to facilitate the operation. This instrument bears the name of ectopœsophagus. Vacca pushed his optimism so far as to think that we should endeavor to obtain immediate union by dieting the patient.

In 1831 Bégin[1] successfully performed œsophagotomy on two occasions. Shortly afterward (1832) Arnolt also performed it in England, without knowing of Bégin's previous operation, but with much less satisfactory results than those obtained by the French military surgeon. Bégin was the first to lay down the rules of the operation in a precise manner. He did not use a conductor, although the foreign body did not project—an act which exceeded the indications of his predecessors in boldness.

Thanks to this awakening, the question assumed a much greater importance in contemporaneous surgery. Temporizing, in difficult cases, was condemned, and it was even advocated that a disturbance of deglutition and respiration of slight gravity demanded the operation.

At the same time, de Lavacherie, a Belgian surgeon, reopened the entire question of foreign bodies in the œsophagus, especially with regard to treatment, and arrived at the conclusion that non-interference had been fatal in many cases, and that œsophagotomy should be performed

[1] Receuil de mém. de méd. et de chir. milit., 1831.

when attempts at extraction or propulsion prove useless. We shall see that these indications are accepted even at the present day. Though very praiseworthy and just in itself, Lavacherie's work does not rest upon very conclusive facts. He was able to collect:

18 cases of almost immediate death.
17 cases of death secondarily.
12 cases of death from hemorrhage.
20 cases of severer, though not fatal, symptoms.
10 cases of abscess with escape of the foreign body.

If all these facts pertained to the œsophagus and to cases of bodies situated in the cervical region, Lavacherie's work would be irreproachable; but this is not so. In the majority of cases, on the contrary, the body was situated in the thoracic portion of the œsophagus, in which the operation is impracticable.

Several operations were then made in France, the results of which were very unsatisfactory, and we must wait nearly twenty years before finding new facts in our country. Flaubert in 1853, and Demarquay in 1854, performed the operation in cases in which foreign bodies were present. Their efforts were not crowned with success, and, despite the favorable conclusions of Follin in the Surgical Society, the operation fell into disrepute. For a long time afterward we only find Sonrier's successful case; but in England, America, Italy, and Germany, the method continued to be used with success. For several years past, thanks to the stimulus imparted to it by Terrier's work, œsophagotomy has again gained our good graces, and has continued to furnish favorable results.

In conclusion, we find that this operation has not passed through many phases, and that it is only after long periods of uncertainty that it has assumed the place which it merits.

Preliminary Precautions.—The operation should not be performed without taking certain preliminary precautions. First of all and most indispensable, is the exploration. It should never be omitted if possible, and we must not follow Syme's rash example, who allowed himself to be guided by the symptoms alone without examination. But if, in some cases, no exploration has been made during the operation, it would be very injudicious to make them the basis of a method which is also unsurgical. We should make an exploration, then, in all cases, and, as Broca advises, pass the sound through the nose, or open the mouth with Stromeyer's forceps.

In this manner we can satisfy ourselves of the presence of the foreign body in the cervical region, or at the distance of a few centimetres, since these are the only points at which surgical interference can be resorted to. The extraction of foreign bodies has been performed as low down as four centimetres above the sternum; but it has been necessary, in such cases, to make efforts at extraction which proved fatal (Inzani).

On the other hand, some surgeons think that the operation is only indicated if the foreign body produces a projection in the lateral portions of the neck. But we have now relinquished this rigorous rule, and œsophagotomy is performed even when the projection is absent. All the questions referring to the general indications, and the proper time for the operation, will be the subject of a special chapter. May we resort to anæsthetics during the operation?

This question has been answered by surgeons in various ways. In America the patients are narcotized; this is more rarely done in other

countries. The rule is that the patients should be anæsthetized whenever the asphyxial symptoms do not directly contraindicate it. Moreover, we may discontinue the anæsthesia after incision of the integument, which is the most painful part of the operation.

Is there a place of election in performing œsophagotomy? I do not hesitate to answer in the negative, as the position of the bodies themselves is not definite. Nevertheless, in the majority of cases, the foreign body is lodged at the level of the cricoid cartilage, and the operation is thereby converted into a true pharyngotomy. Whenever the situation of the body permits, we must make the incision in such a manner as to avoid the thyroid arteries, two transverse vessels of this region. With the exception of this precept, which does not constitute a rule, the operation may be performed in any position.

Manner of Operation.—Œsophagotomy is performed in a different manner, according as we do or do not use a conductor, sound, or special instrument. Hence I shall describe two methods:

1. The Method without a Conductor. Bégin's Method.—It is performed under three well-defined conditions:

1. The body is so large that a catheter cannot be passed below it.
2. The body is situated very high.
3. The body projects upon one of the lateral walls.

The patient is placed upon a slightly elevated bed, and the head carried backward by means of a hair cushion placed under the neck. The surgeon stands to the left, the assistant, who holds the patient's back, to the right. The face of the patient is slightly turned toward the side on which the assistant is standing.

At a height, which is previously determined in each particular case, an incision is made seven or eight centimetres long, which does not descend lower than two centimetres from the sterno-clavicular articulation, and, superiorly, does not pass beyond the upper border of the cricoid cartilage. This incision may follow the anterior border of the sterno-mastoid muscle, or may even be made a centimetre in front of it. The skin being thus cut, as well as the superficial aponeurosis, all arteries or veins must be carefully tied. The operation is then begun, as in ligature of the primary carotid, by penetrating into the cellular tissue which separates the sterno-mastoid from the infra-hyoid muscles, and this tissue is torn with a grooved director or with the finger. Two assistants separate the two sides widely. A path being thus made, we come in contact with the omo-hyoid muscle, which is pushed aside, if possible. Bégin cut the muscle.

At this period one of the assistants forcibly pushes the larynx, trachea, infra-hyoid muscles, and thyroid body inward and forward; another assistant draws back the outer lip of the wound, in which the large vessels of the neck are found. It is then advisable to suspend the anæsthesia.

The surgeon slowly reaches the deep cervical aponeurosis, not using the knife, but separating the tissues with the aid of the grooved director. If he has taken care to tie all the necessary vessels, he will be able to guide himself; otherwise, the sanguineous infiltration into tissues, which have been previously swollen from the mere presence of the foreign body in the œsophagus, will render his progress very annoying and dangerous. At this stage of the operation, the surgeon should search for the foreign body, with the right index finger, below the cricoid cartilage or trachea.

As œsophagotomy is not performed without a conductor except when

the bodies are very large or projecting, this period of the operation does not present the difficulties which occur in searching for the normal canal. As soon as the precise situation of the foreign body is known, the left index finger is placed upon it, and upon this, with the aid of a bistoury, we cut the lateral wall of the œsophagus, following the long axis. The opening is sufficiently enlarged with the grooved director, or by means of a probe-pointed bistoury, to permit extraction without tearing the tissues. If the incision has not been made at the level of the foreign body (as sometimes happens), we must endeavor to extract it, and for this purpose may use either the fingers or forceps, according to circumstances, care being taken to avoid all violence. Such is the method of performing œsophagotomy without a conductor. Bégin, Demarquay, Syme, Arnold, and Sonrier have performed their operations in this manner. But we should use a conductor whenever we can, because, upon the admission of even the greatest surgeons, the operation becomes uncertain when the operator reaches the deep parts, if he is not guided by anatomical facts.

2. Œsophagotomy upon a Conductor.—Several instruments may be used as conductors. The simplest of all is the steel or silver urethral sound. This instrument has rendered valuable services to the Americans, and is extolled by Terrier; it has been employed in sixteen operations. Experience has shown that its introduction, as well as that of all other conductors, whatever they may be, is very distressing. However, we must exercise patience and care, and make several attempts in order to introduce it without violence.

Ectopœsophagus of Vacca Berlinghieri.—One of the oldest conductors is that invented by Vacca Berlinghieri at the beginning of this century. I reproduce from the author the description of his ectopœsophagus: "This instrument, to which, from its facility of displacing the œsophagus, one of my friends, a distinguished Hellenist, has applied the term *ectopœsophagus* (ἐκτοπεὶν, to displace), is formed of two parts, a canula and a mandrel. The canula is of silver or some other metal, is three or four inches long, and a little larger than the largest urethral catheters. One end is open, the other presents a cul-de-sac. The open extremity carries upon the sides two rings, each of which is readily capable of admitting one of the surgeon's fingers ; the canula is slightly curved, and presents thus a convex and a concave surface. The side which is to the left of the patient, when the concavity is turned toward the surgeon and its open end upward, presents a large fenestra, which commences only a line from the cul-de-sac and extends almost half of the canal along its axis. The size of this fenestra is proportionate to the dimensions of the mandrel which must pass through it.

"The other portion of the instrument is formed of steel wire, containing a ring at one end. From this end up to the middle there is nothing noteworthy; from this point to the opposite extremity, the mandrel is divided into two equal parts. This end, shaped like an olive, is composed of two half-olives. These two parts tend strongly to become separated, and would not remain applied to one another to form a single whole, if they were not compelled by a force greater than that which separates them. This mandrel does not have exactly the same curve as the canula, but is somewhat greater ; however, the difference is not sufficiently great to prevent the mandrel, which is elastic, from penetrating the canal and from passing through it from the open extremity to that which terminates in a cul-de-sac.

"We prepare the instrument by introducing into the canula the olivary

extremity of the mandrel, the united ends of which are held with the fingers. This is then pushed on until the olive has reached the bottom of the cul-de-sac, and with a finger we prevent the left portion from going through the fenestra of the canula by passing through it from behind. Matters being thus prepared, it is not difficult to understand that, if the surgeon introduces the index and middle fingers into the rings of the canula, and the thumb into that of the mandrel, and if he fixes the first and withdraws from it the second, the point of the latter will abandon the cul-de-sac, and that the olive, not being retained to the left on account of the presence of the fenestra, will divide ; one-half will be separated from the other and will bend outward. Not only will this half of the mandrel be carried to the left and leave between it and the canula a space of nearly an inch, but it will also reach almost an inch further forward, because, as we have previously stated, the curvature of the mandrel is greater than that of the canula, and will resume it as soon as it is free and no longer retained by its walls.

"By holding the canula fixed and by continuing to draw, with the other hand, upon the ring of the mandrel, the olivary extremity will re-enter the tube and again become invaginated.

"Two of these instruments are necessary, because the surgeon may have to perform œsophagotomy both on the right and left sides; one of them must carry the lateral opening on the right side and the other on the left. Nevertheless it would be easy to construct one which would serve for

FIG. 24.—Vacca Berlinghieri's catheter, modified by Charrière. A, catheter. B, projecting spring.

both sides, only, in such a case, it must be fenestrated on the right and left, and it would be necessary to have two mandrels; the one should have the left demi-olive too large to escape through the corresponding fenestra, the other should have that on the right too large to escape through the right fenestra. In ordinary cases, that is to say, in operations on the left side, we would employ the latter, and, in unusual cases, the former."

This instrument has become classical, yet the reader will be astonished to learn that it has only served once for œsophagotomy, in the hands of Prof. Richet. What are the indications for œsophagotomy upon a conductor? The answer is easy: it must be employed whenever possible.

I will now pass to the various stages of the operation:

1st period: Incision of the integuments, as in the preceding operation.

2d period: Incision of the aponeurosis, and separation, by means of a grooved director or the finger, of the infra-hyoid and sterno-mastoid muscles—incision of the omo-hyoid. Drawing of the trachea forward, and of the vasculo-nervous plexus outward.

3d period: Introduction of the conductor. The ectopœsophagus having reached a suitable point, the spring is made to project, and the surgeon intrusts the instrument to an assistant, while, with the left index finger, he searches for the groove of the canula. It is isolated, when found, with the grooved director, and the incision is made upon the spring,

care being taken to make the incision sufficiently large. The instrument is then withdrawn.

4th period: Extraction, direct and immediate, or mediate and indirect, by the aid of extractors, or curved forceps. If necessary, we may break the foreign body, if it is too difficult to extract. These are the two classical methods of œsophagotomy for foreign bodies. After the operation we must treat the wound.

Some (de Lavacherie, Hitchcock), following the recommendation of Maunoir and Vacca, have attempted partial reunion of the wound by means of adhesive plaster or sutures; but the large majority of surgeons restrict themselves to a simple dressing. Lister's dressing gives excellent results in such cases, and excludes the dangers of septicæmia. Gross, of Philadelphia, has attempted to obtain primary union of the œsophagus by a few points of catgut suture, which afterward fall into the stomach. Terrier proposes suture of the mucous membrane alone.

Another very important question concerns the regimen of the patient. Must he be put on absolute diet, or be allowed to take fluid food? Almost all the surgeons have tried absolute diet at least during the first twenty-four hours. Others have attempted to sustain the vital forces by means of nutritive enemata. At the present time we know that this measure does not in the least arrest the progress of inanition and marasmus. The authors who have paid most attention to the subject think that nourishment should be given through the œsophageal sound. Its introduction temporarily produces serious symptoms, it is true, but they cannot be compared with the dangers of the low diet which the presence of the foreign body produces, perhaps, for several days. If the patient has not been anæsthetized, we may, after the operation, introduce a nutritious mixture into the stomach by means of a sound. In this manner we may restrict the diet for twenty-four hours, during which the reunion of the œsophageal walls will commence.

In order to remove the inconveniences and difficulties of alimentation, Gross devised his suture of the walls, which failed in Cheever's hands. Will the suture proposed by Terrier, by which it is intended to avoid including the contractile muscular coat, succeed better? There is room for doubt, if we recall the extreme difficulty of sewing together the lips of a wound of the intestinal mucous membrane.

As a rule, inflammation and suppuration of the wound supervene at the end of a few days, and may produce other accidents. It is often irritated by the exit of the food which the œsophagus allows to partially pass through the wound. Thus, among reported observations, we find peripheral inflammation of the lips of the wound, ulceration, and even hemorrhage in one case.

Little by little the exit of alimentary matters diminishes, granulations spring up, and cicatrization occurs from the twentieth to the thirtieth day, at the same time that the general health is restored, if no complications develop.

Is recovery complete? We presume so, as all the authors are silent on this question. We must, therefore, until taught otherwise by future revelations, discard the vain fears of secondary stricture which have been used as arguments against the operation.

Results of Œsophagotomy.—Although not numerous, the results of this operation clearly demonstrate its utility. Among thirty-two well-authenticated cases of œsophagotomy which I have collected, twenty-four of which are reported in Terrier's work, there were only six deaths.

If we consider the exceptionally grave circumstances under which the operation is performed, the success will appear even greater. More than two-thirds of the patients operated upon would undoubtedly have succumbed more or less quickly to the primary or secondary accidents. The following observation, which was published very recently, will show the advantages of this method in almost desperate cases.

Observation by MacKeown of Belfast.—M. G. had swallowed, three months previously, a plate of false teeth, which lodged in the œsophagus. Various unsuccessful attempts were made to dislodge it. By palpation the body could be felt at the lower part of the neck on the right side, and the diagnosis was confirmed by means of catheterism with a sound provided with a metallic tip. The patient could still swallow fluids. By external manipulations the foreign body was forced from the right side to the left, and it appeared to have risen somewhat. After two trials it was seized with a strong, long œsophageal forceps; upon the second attempt the most alarming symptoms supervened. The forceps grasped the object very firmly, and it could readily be displaced transversely from one point to another, but when it was drawn upward the patient became livid, the respirations appeared to cease, he was unable to speak, the tongue protruded from the mouth, and the eyes became staring. Tracheotomy appeared necessary, but, fortunately, upon letting go and withdrawing the forceps, all the symptoms disappeared. Twelve days later œsophagotomy was performed, the incision being made from the left of the middle of the thyroid cartilage to the sternum; no conductor was used. Section of the œsophagus was readily performed, but much more difficulty was experienced in withdrawing the plate on account of its situation, its inequalities and projections. The patient did well; he was nourished for a week through the œsophageal sound, and the wound in the œsophagus had united on the seventh day. The plate contained three teeth. (The Lancet, June 8, 1878, p. 834.)

How does death occur in the unfortunate cases? In one case the patient died of pneumonia, which had existed at the time of the operation. The cause of the failure was several times found in a local condition, such as gangrene of the œsophagus, or peripheral abscesses opening into the visceral cavities. Callender reports that he saw Stanby perform œsophagotomy upon a man who had swallowed a bone, the attempts at extraction through the mouth having failed; the patient died of an abscess of the pleura. The foreign body had passed into the pleura and mediastinum prior to the operation and caused extensive suppuration.[1]

However, one practical fact may be deduced from the study of these unfortunate cases. Almost all these operations have been performed late, at a period in which severe inflammatory symptoms had developed. On the contrary, the more promptly the operation is performed, the greater the chances of recovery.

The Choice of the Method of Treatment.—From the preceding considerations it will be very easy to understand the indications of each of the chief methods of treatment. The older authors only give vague aphorisms here and there, instead of definite rules with regard to treatment. The operations of extraction and propulsion are very old, but no precise distinctions were made between them. One was employed, then abandoned, then again taken up without method. In the Middle Ages, A. Peré, Guy de Chauliac, Paul d'Egine, followed the old ideas, but studied special cases with more care. It is not until the eighteenth century, when the celebrated treatise of Hévin, which contains a résumé of the ideas prevalent in his time upon the question, appeared, that we find rational notions advocated. The work done by this surgeon is considerable; it consisted of a synthesis, unknown until then, of all the cases which were scattered throughout the works of his predecessors.

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[1] Lancet, 1878.

Among the hundreds of cases the question of treatment predominates. It engages Hévin's attention more than all others, and he makes it the basis of his division into four chapters: 1st, foreign bodies which must be pushed on; 2d, bodies which must be extracted; 3d, bodies which should be extracted and which may be broken; 4th, bodies which can neither be withdrawn nor pushed forward.

From the appearance of this treatise up to the present time, authors have confined themselves to reproducing and adding slightly to the classification and precepts which it contains. Some believe that we can no longer be governed by the limits fixed by Hévin, and that a number of his suggestions, especially those which refer to propulsion, are very disputable.

De Lavacherie, and later Denucé, have proposed to divide foreign bodies, with regard to treatment, into large and regular, angular and irregular bodies. Though much simpler than the old division, it does not possess the importance attached to it by its authors. Irregularity may serve as a basis with regard to treatment, but the size does not enable us to make a choice between the various methods. The ingested cork referred to by Eve, and for which œsophagotomy became necessary, was a regular body. In 1854 the question of treatment in foreign bodies of the œsophagus was discussed before the Surgical Society in a very hasty manner, though it enables us to determine the ideas of the surgeons of that period. Follin made a résumé of the opinion of the majority in the following propositions:

"In conclusion: 1, if we cannot promptly extract certain regular foreign bodies, we must push them into the stomach; 2, we should prefer œsophagotomy to very frequent attempts at extraction, which may produce stricture or perforation." Thus extraction, at a certain stage, was decried, owing to the insufficiency of the crude methods of that period. J. Cloquet arrived at the same conclusions in a special case, which led him to devise his curved forceps.

Can we not, at the present time, trace with more precision the line of conduct which the practitioner should follow in individual cases? The answer is in the affirmative. Œsophagotomy, so new even at the time when Hévin wrote, has become a method which is fertile in results, a precious measure in the hands of the surgeon, and it should take rank side by side with propulsion and extraction. When its relative harmlessness has become manifest from the publication of more numerous cases, it will enter definitely into the domain of practice. But may or should the surgeon indifferently resort to one or the other of these methods? Evidently not, and the indications for each of them must be carefully defined.

And first, the thought which immediately strikes us, the fundamental idea of all treatment of foreign bodies, is the following: a body, which is lodged in the œsophagus, produces symptoms either by its size, irregularity, or unevenness. It must be withdrawn. If it has been arrested in its course, this is due to one of the accidental causes to which I shall allude, and it becomes necessary to remove them, in order to follow a rational plan of treatment. The best means of removing these causes is to extract the body, and extraction pure and simple is of all means the most natural. I hasten to add, in order to keep within proper limits, that this principle must not be followed blindly, but that exceptional circumstances occur which compel the surgeon to resort to other methods.

Is propulsion as rational a method as extraction? It cannot be so,

as it must overcome a resistance, and thus has often become the starting-point of serious complications. I will take an illustration: a foreign body, such as a piece of bone, or a large, somewhat irregular object, is lodged in the middle part of the œsophagus; all attempts to push this body into the stomach must be very violent, in order to force the obstacle to follow the natural route, and will be followed either by an exaggerated distention of the organ in the milder cases, or by an erosion or perforation of the canal in the more serious cases. As a rule, these accidents occur less frequently in extraction, except in individual cases in which the foreign bodies have a special conformation (corn-stalk, fishes, false teeth), and the withdrawal is easily accomplished by following the course which they pursued in entering. Finally, œsophagotomy, like propulsion, should not be regarded as the primary means of treatment. It is, in the present condition of science, the last resort in grave cases in which other methods have failed. Nevertheless, if we regard it as a method of indirect extraction, it verifies the principle which I established in the beginning, viz., that *extraction is the most natural plan of treatment.*

Granting this, if we pass from the general to the particular, we will not fail to perceive that extraction has always been the method which is immediately resorted to by surgeons. Thus the emetics which are often administered are intended to produce efforts of natural extraction. How often has emesis put an end to the most serious symptoms!

However, we only imitate nature in such cases, as we know by what efforts at vomiting the unfortunate individuals who have swallowed a foreign body are often tormented. But, it will be said, is it not better, following the example of our ancestors, to push into the stomach those alimentary masses, the harmlessness of which is demonstrated by the numerous examples reported by authors? Is it better to extract them than to produce propulsion? In answer to these questions, I will say that primary propulsion is a blind manœuvre in all cases, even when applied to the most digestible alimentary masses. If the works of our predecessors, if the cases reported by Hévin, also demonstrate the tolerance of the œsophagus and other parts of the digestive tract for large and irregular bodies, they more often prove the dangers of the method. In a large number of cases of death following the ingestion of the foreign bodies, propulsion had been performed. How often also has the endeavor been made to push the foreign body down, even when in reality it had been plunged into the walls! Illustrations of these examples are so striking that I think it wise to restrict the employment of propulsion to exceptional cases. I will cite, in support of the preceding view, a few examples of accidents which were manifestly due to this method.

Observation.—A man, æt. forty five years, swallowed a bone which lodged behind the sternum a little below the notch; useless attempts at extraction with the œsophageal sound and Graefe's basket; propulsion. Upon the following morning very acute retro sternal pain, and death at the end of a few hours. Upon opening the thorax, the pleuræ were found inflamed, the peri-œsophageal cellular tissue, which was infiltrated with an opaque fluid, had a grayish tint and a gangrenous aspect from the third dorsal vertebra to the œsophageal orifice in the diaphragm. A rounded perforation of the œsophagus as large as the head of a large pin, upon the right antero-lateral wall of this canal at the height of the upper third. The œsophagus, when incised throughout its whole length, presented two grooves extending to the neighborhood of the cardia, and which had involved almost the entire thickness of the mucous membrane. The foreign body had fallen into the stomach; it was a flattened bone of triangular shape with curved sides and extremely acute angles. (Lannelongue of Bordeaux.)

Observation by Lannelongue of Bordeaux.—A man, twenty-eight years of age, while eating, felt a foreign body lodge in the fauces. The œsophageal sound met an insuperable obstacle at the height of the cricoid cartilage. Graefe's basket seized the object, but let it drop after several attempts. Denuc's instrument let it slip without even having moved it; nevertheless the patient expectorated some sanguinolent mucus. Finally, after attempting extraction for an hour and a half, it was pushed down with the sponge. On the following day, pain along the entire œsophagus; deglutition greatly distressed; slight emphysema was observed on the lateral portions of the neck; symptoms of pleuro-pneumonia on the third day, and death on the eighth day after propulsion. (Martin: Thèse de Paris, 1868.)

Many authors, among others Fortuné,[1] have followed their observations by remarks which testify to their slight confidence in propulsion. Martin[2] states that this is also the opinion of Bordeaux surgeons as well as his own. He protests against propulsion of irregular foreign bodies as a bad method, which is wrongly based upon exceptional cases of harmlessness.

How should the surgeon act when a foreign body has been swallowed? I will suppose that the exploration as well as the diagnosis has been made with the greatest care. After having investigated the conditions of adhesion of the body in the canal, the surgeon should proceed to perform extraction. Two cases may then present themselves:

1. The body can be directly seized by a prehensile instrument.
2. It cannot be so seized.

In the first case, if there is no adhesion or impaction, we may withdraw the body without any great difficulty after a few attempts.

In the second case, it cannot be seized, either because it is too large or hard. We may meet with the two following varieties:

1. The instrument may be passed below the foreign body.
2. The instrument cannot be passed below it.

In the first variety, if the instrument can pass beneath the foreign body, we must endeavor to extract it by all the means which I have described above.

In the second variety, extraction by these two measures is impossible, and it is necessary, as we shall see, to resort to œsophagotomy or propulsion.

En résumé, we see that extraction is indicated in all cases in which the body may be withdrawn, either with the aid of prehensile instruments or with instruments which act from below. We must only except, as I have already stated above, those very rare cases in which the irregularities of the object will certainly wound the canal. Even in such cases extraction is still possible, if we can neutralize the action of these irregularities. I mention as an illustration the well-known case of a fish-hook which was extracted by means of a pierced ball which was made to slide along the fish-line.

We will now pass to the indications of the other two methods. The previous remarks upon the secondary rôle usually assigned to propulsion in treatment will enable us to comprehend why this method will only apply in a few cases. As certain large foreign bodies, which have lodged in the œsophagus, will not permit instruments to pass beneath them, we must either push them into the stomach or extract them directly by means of œsophagotomy. But in which cases do we prefer one or the other? May they be employed indifferently? Finally, do they find any

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[1] Recueil de méd. et de chir. mil., T. XXXVI., p. 255. [2] Thèsis of 1868.

application apart from extraction? It is undoubtedly very difficult to solve these complex questions, since the attention of surgeons has only been directed for a short time to the advantages of œsophagotomy; but we may state that the latter operation presents very clear indications which have been laid down in an *ex cathedra* manner in Terrier's original work.

1. In the first place, this operation can only be performed in the cervical region.

2. It will scarcely be of any use except when the foreign bodies are lodged above the sternum or very near the sternal portion of the œsophagus.

3. It should not be performed except in those cases in which the foreign body is large or irregular and when the other methods have failed.

In fact, this condition of irregularity is indispensable, for if the body is regular and comparable, or even slightly disproportionate, in size to the dimensions of the œsophagus, it is better to push it into the stomach. Propulsion in such cases will not be harmless, but its gravity cannot be compared with the chances of the bloody operation. I will formulate these precepts for the cervical region in the following manner:

Propulsion is indicated in foreign bodies of the cervical region when they are regular and cannot be extracted, whether large or small, and especially when they are capable of being digested by the intestinal juices.

On the contrary, œsophagotomy must be performed whenever the foreign body cannot be extracted, and is large, irregular, and of such a nature as to lead to secondary symptoms, if it should pass into the stomach.

Moreover, an examination of the bodies, which have hitherto been extracted by œsophagotomy, verifies these statements. Thus, among twenty-two known cases, collected by Terrier and some more recent writers, we generally find (fourteen times) irregular pieces of bone, presenting more or less well-marked projections, and attaining a very considerable size. With the exception of two cases in which coins were removed by Demarquay and Syme, all the other bodies were very irregular, such as metallic plates containing false teeth, pins, a peach-pit, a fish, a cork-stopper.

Large size and irregularity were only wanting in two cases (coins), and these are unable to invalidate the rule. If we refer to the history of these particular cases, we will readily see that œsophagotomy was not sufficiently indicated in the one, and that it was only employed as a last resource in the other. But therapeutic rules cannot be based upon such exceptions.

The indications for the operation appear early, it is evident, since they are produced by the failure of other methods, on the one hand, and by the shape of the foreign body, on the other. From an examination of the published facts, it appears that the operation has been either proposed or performed in the week following the accident. It has never been performed on the first day, but several times on the second. The later operations do not give as satisfactory results as primary œsophagotomy. Not infrequently the surgeon cannot perform the operation at the proper time, either because the patient does not consult him until after the appearance of formidable symptoms, or because the patient and his friends do not consent to the operation. The gravity of interference in such cases is increased by the marasmus from which the patient is suffering, and which is due to the œsophagitis and also to the progressive inanition. All authors, who have been unfortunate in such cases, wisely insist upon these disastrous conditions.

Bégin well understood the necessity of prompt and decisive action when he wrote: "It is in the midst of this perplexity that the days slip by, while the danger increases at the same time, and the opportunity for the operation is lost. The most difficult limit, perhaps, to determine in practice is that in which we can no longer rely reasonably upon the efforts of the economy, and in which, consequently, the surgeon must try even hazardous measures in order to relieve the patient." (Bégin, 1833.)

The operation should be performed as soon as indicated, without delay and without waiting for miraculous efforts on the part of nature. Delays usually aggravate the situation, render the operation more difficult, and its results more problematical. It has been truly said that the operation for foreign bodies of the œsophagus is like the reduction of strangulated hernia or of luxations; the wisest practice, and the one which gives fewest bad results, is to perform reduction *nolens volens.*

Hitherto I have designedly omitted the discussion of bodies situated in the thoracic portion of the œsophagus. We must not confound the latter bodies with those in the cervical region. The gravity of the symptoms which they cause often results from our therapeutic impotence.

How shall the surgeon act in such a case? He must follow the same rules as the preceding, and must endeavor to extract them. Here, more than in other cases, propulsion is very dangerous, while well-performed and moderate extraction will subject the patient to less danger. Unfortunately, the action of instruments is very difficult and often illusory, at such a depth, and the fear of producing accidents restrains the surgeons. Propulsion has almost always been practised in such cases with the most variable results.

Œsophagotomy being impossible in this region and extraction often impracticable, but two equally grave solutions remain to us, and are equally fertile in failures.

1. We may perform forced propulsion.
2. We may leave the foreign body to itself.

Each of these methods of action has been followed by successful results and is justifiable; they are the only means left in those desperate cases which are almost beyond the resources of art. Nevertheless, when we reflect upon the imminent dangers which the presence of the foreign body in the region of the large vessels may produce, we are led to believe that interference will be less dangerous than the expectant plan. We will therefore make the following résumé:

When a foreign body is situated in the thoracic region of the œsophagus, we should endeavor to extract it without violence by all possible means.

If extraction fails, nothing remains but propulsion or the expectant plan. Despite the gravity of the situation, the preference should be given to propulsion.

Treatment of the Symptoms.—Under some circumstances the surgeon, when called to attend a patient, cannot think of extracting the foreign body. In fact, if asphyxia is imminent, if the symptoms of compression and suffocation are very intense, he must hasten to arrest the progress of the affection and to save life.

Moreover, when the history is wanting, the surgeon is often ignorant of the nature of the affection, and, if he suspects its origin, the intensity of the respiratory symptoms will much more naturally lead him to think that the object is situated in the larynx than in the œsophagus.

Surgeons have resorted to tracheotomy several times in order to ob-

viate the accidents caused by an ingested substance. At other times, during a period in which the therapeutics of this class of affections was still very primitive, the patients were abandoned to their unhappy fate, whenever the bodies could not be pushed into the stomach or extracted; bronchotomy became a last resource in the hands of the able men of that period. Hévin is very explicit in this respect, and states: "Foreign bodies are sometimes lodged in the pharynx or œsophagus in such a manner that they cannot be withdrawn or pushed forward by any operation or other measure. These bodies sometimes produce very urgent symptoms, and if the patient is not rescued his death is certain. This especially occurs if the foreign body is of considerable size, or if it compresses the wind-pipe to such an extent that the patient is in imminent danger of suffocation."[1] Prior to Hevin, Habicot[2] had laid down the performance of bronchotomy as an absolute rule, and condemned the conduct of those who adopted the expectent plan in such cases. "It is necessary," he says, "to perform this operation upon those who have swallowed anything which stops up the larynx by compression, as in the case of an individual who, having swallowed a bone from a shoulder of mutton, which lodged in his pharynx, suffocated in the presence of the physicians and surgeons, who did not resort to this method." Moreover, this surgeon had the opportunity of saving a patient by following this plan; and Louis, in his treatise upon bronchotomy, has copied this interesting and picturesque observation:

Habicot's observation.—A field-hand, about 14 years of age, had heard it said that swallowed gold produced no bad effects. Having sold some goods in Paris, for which he received nine pistoles, he placed them in a cloth, which he swallowed for fear of robbers. But as the coins were unable to pass the isthmus of the fauces, his face became so frightful and deformed by the swelling and blackness, that those who accompanied him failed to recognize him. When he was brought to me I performed bronchotomy, not being able to push the obstacle into the stomach, because it was prevented by the swelling of the fauces, and thinking that he would choke. This being done, there was such a rattling in the throat from the violent entry of the air, that it frightened those around him, but the disappearance of the swelling and bad color of the face reassured him, especially after I had introduced a leaden sound into the œsophagus, in order to push the so-called tampon into the stomach. Five or six days later he passed the coins at various intervals, and made a prompt recovery. (Premier mémoire de Louis sur la bronchotomie, in Mém de l'Acad. royale de chirurgie.)

The literature presents several facts of the same character, which have not always terminated so fortunately.

Broca[3] and Legouest have performed tracheotomy, under various conditions, upon patients who have swallowed foreign bodies.

But these are not the only cases in which this treatment was followed, and, according to Desault, tracheotomy has been performed without reason, on account of errors in diagnosis. "Avoid the error," he says, "into which a surgeon, otherwise well instructed, once fell. All the signs of suffocation appeared after disturbances in deglutition. Bronchotomy was performed, but nothing was found in the trachea, and the foreign body was believed to be in the bronchi. The patient died, and, to the astonishment of the physician, the body was found in the œsophagus."[4] A similar mistake can be undoubtedly avoided if, before operating, the physician passes a sound into the œsophagus, explores this canal, and satisfies

[1] Hévin: mémoire, loc. cit., p. 353.
[2] Question chirurgicale sur la bronchotomie, Ch. XVI.
[3] Société de chirurgie, 1865.
[4] Desault: Œuvres, T. II., p. 261.

himself of the condition of its functions, for it is very difficult to imagine that a body could pass unnoticed, and, nevertheless, produce such severe functional disturbances.

Notwithstanding the positive utility of tracheotomy when employed as a palliative remedy, this operation is none the less very rarely indicated, and is only practised in extreme cases. It should not be performed except when the danger to life will not permit immediate attempts at extraction.

FOREIGN BODIES OF THE STOMACH.

DEFINITION.—GENERAL CONSIDERATIONS.

The term foreign bodies of the stomach refers to the solid bodies which are abnormally present in the interior of this organ. The first indispensable condition which they must realize is their absolute insolubility in the gastric juice. Consequently we find less foreign bodies of alimentary and digestible origin than in the œsophagus.

In addition, the foreign bodies of the stomach must either be larger than the usual dimensions of the pylorus, or of a very irregular form, in order to become imbedded in its walls. For these reasons the foreign bodies of the stomach are very long, or very small and irregular. As illustrations of the first variety, I will mention forks, knives, etc., and needles as examples of the latter. All those which have an intermediate volume will readily pass into the furthest parts of the intestines, and are not, properly speaking, foreign bodies of the stomach. Their more or less prolonged stay is an indispensable condition in all cases, which is very rarely realized.

Even recent authors do not separate, in a general study, foreign bodies of the stomach from those of the intestines. I do not think that such a plan should be adopted, because the causes of arrest, as well as their final fate, differ for various objects. Cherry-pits and grape-seeds, for example, which may cause such grave accidents further on, are never permanently arrested in the stomach. In addition, the treatment is not the same in both cases, and it is necessary to study separately the symptoms produced by the prolonged presence of ingested substances in the cavity of the stomach.

Etiology.—I refer the reader to the previous remarks on the etiology of foreign bodies in the œsophagus, since it refers to the same substances which have advanced slightly further. We must, nevertheless, exclude those which have undergone extraction, or those whose physical and chemical properties are incompatible with their presence in the stomach. Thus fishes, leeches, etc., disappear from our new category of foreign bodies, because they are digested or dissolved. Moreover, their number is even more limited on account of the different dimensions of the stomach from those of the other parts of the intestinal tube. Such bodies as fruit-stones or coins, which are arrested by the œsophagus, pass through the stomach as rapidly as other matters. The category of foreign bodies of the stomach is consequently less rich in cases due to accidents than that of the œsophagus.

CHAPTER I.

CIRCUMSTANCES WHICH FAVOR THE ARREST IN THE STOMACH.

Apart from general, predisposing, or occasional causes, the stomach, by its shape, structure, and functions, favors the arrest of certain bodies to the exclusion of others.

Predisposing causes resulting from the shape of the stomach.—This organ forms a large cavity, in the upper part of which the irregular bodies arrive. The action of gravity makes them fall into the lowest part, which is found to be the greater curvature beneath the pylorus.

If, by its structure, its points or irregularities, the foreign body hooks on to the mucous membrane, it will not follow the same course ; on the other hand, the heavier the body is, the more readily it will descend. Lumps of lead, spoons, and knives are placed transversely in the lower part of the organ and obliquely directed along its long axis, that is to say, from left to right, and from above downward.

The study of these considerations is not unimportant in the search for the foreign bodies and in the genesis of the symptoms. Whenever cases of ingestion of forks have been observed, the handle is found situated to the right of the pylorus, and the prongs to the left. This disposition depends, on the one hand, upon the manner of introduction, and, on the other, upon the manner in which foreign bodies are always placed in the stomach, and to the persistence of this disposition which the peristaltic movements hardly ever modify.

Influence of the pylorus upon the arrest of foreign bodies.—The existence of a narrow sphincter, the pylorus, at the lower end of the stomach, is the most active predisposing cause. To a certain extent it regulates the dimensions of the bodies which are able to pass it. Unfortunately experimentations is not in accord with the facts, and nature has sometimes succeeded in effecting what we are unable to achieve upon the cadaver without producing rents and ruptures of the tissues. A one-franc piece passes very readily through the pylorus ; a two-franc piece passes through with some difficulty; and a partial rupture must be produced in order to push a five-franc piece into the intestines. These experiments have been made, it is true, exclusively upon flat objects, and they should be repeated with rounded bodies. But facts speak stronger than experiments, since large objects, such as knives, metal bars, forks, bats, etc., have been known to overcome the narrowness of the sphincter and to pass through the pylorus within a few hours. By what mechanism is this passage effected? This is not known. Must we consider it due to peculiar anomalies or look for other reasons? The question is still *sub judice.*

Influence of the inferior cul-de-sac.—There is still another consequence of the anatomical arrangement of the organ which is favorable to the arrest of bodies, especially of those which are large and heavy. I refer to the existence of a cavity below the pyloric orifice. After digestion, this cul-de-sac is effaced under the influence of peristaltic contractions, and thus enables the stomach to empty its entire contents into the intestines. If a somewhat large and heavy body is present at the bottom of the stomach, the latter will experience an abnormal resistance, over which

it does not always triumph, and which will prevent the passage of the obstacle into the intestines.

Influence of the condition of fulness or emptiness of the stomach.—However, though this is the mechanism of the arrest of the foreign bodies in general, it does not constitute a rule, on account of the infinite variety of the etiological factors, of the bodies themselves, and of the functional condition of the stomach. Even a large body, which falls into the stomach during a meal, may not produce any symptoms on the part of this organ, and will readily pass the pylorus with the other alimentary matters. On the contrary, if the accident occurs during a condition of emptiness, it will not pass so readily, and its mere presence may produce symptoms which will render its final passage more doubtful.

Such are the normal or casual circumstances which play a part in the arrest of the foreign bodies. There are also others which refer to the individual, such as age, sex, and profession, but their influence is not so great. In a general way, childhood and the male sex appear to be more especially predisposed to these accidents, without any well-marked predominance.

The configuration of the foreign body, its structure, size, physical and chemical properties, are not unimportant with regard to its arrest. The larger it is the more it will deviate from the ordinary conditions of alimentary substances, and consequently the more incompatible it will be with the functions of the organ.

CHAPTER II.

NATURE OF FOREIGN BODIES OF THE STOMACH.

They are naturally divided, from a surgical point of view, into those which can effect a passage and those which remain in the stomach. The first are evidently the most frequent; they have been described in the general study, and only present a moderate amount of interest. The description of the second presupposes that they are of considerable dimensions, sometimes broad, very heavy, or covered with irregularities. In fact, all belong to this category. It includes forks, spoons, bars of lead, pins or needles, knives, pebbles, coins, pieces of wood. The list is very large, but there is always some peculiarity which explains the cause of their arrest. All are not arrested in the same degree, and there are some which, despite the strange caprices of nature, are doomed to remain indefinitely in the organ. Though spoons and forks can be digested, it would be manifestly unreasonable to expect a similar complaisance with regard to the hoop of a barrel fifteen inches long, a description of which was given by Fournier in the history of the autopsy of a convict who had twenty-two objects, weighing a pound, in his stomach. These cases of multiple bodies are not peculiar to men, as is shown by the following case:

Observation.—A girl, twenty-two years of age, vomited black matter. She died, and, upon autopsy, the stomach was found to contain two keys, nails, needles, coins, glass, pen-knives, the handles of six spoons and the bowls of three others. The inner coat of the stomach was inflamed and ulcerated at several points.

It is not rare to find several bodies lodged in the stomach at the same time, because these accidents usually occur in the insane who endeavor to commit sucide, and who are very careless with regard to the character and number of the bodies which they ingest, or in braggarts who, after drinking or making a wager, swallow objects which excite public astonishment by their size or form. Thus we frequently find knives, pebbles, coins, etc., present at the same time.

CHAPTER III.

PRIMARY SYMPTOMS AND ACCIDENTS.

The symptoms produced by the presence of foreign bodies in the stomach vary greatly, and depend upon an essential element, viz., the length of their stay in the organ. The relations uniting these two factors are readily understood, as the stomach is a transition place, in which alimentary matters merely undergo preparation, the duration of which does not exceed several hours. The larger number of refractory substances which fall into the stomach are subjected to the functional properties of the organ, and carried away in the same manner as the food which is usually chymified with them. But if, in consequence of conditions enumerated above, there is some obstacle of an organic or functional origin, some incompatibility between the dimensions of the pylorus and the ingested body, then the latter will be arrested.

In the great majority of cases, the foreign bodies, which do not become lodged, produce no symptoms. Moreover, it very often happens that the patient has no knowledge of them, and that the euphoria, frequently observed after the entrance of a foreign body into the stomach, persists indefinitely until the object passes out in the stools. This tolerance of the stomach is so great that it has been entered by lithoplaxes, etc.

Slight Symptoms produced by Foreign Bodies which are not Arrested.—This rule, however, admits of exceptions, and we sometimes observe slight symptoms by which the foreign body manifests its presence in the stomach. Either the patient experiences a sensation of weight during digestion, or an intermittent epigastric pain, the character of which varies infinitely in individual cases.

Such is the almost absolute indolence of the stomach for all bodies which are small and regular; it may even extend to larger and more irregular objects. The literature presents some curious examples.

Coins, irregular metallic plates, peach-stones, pins, nails, the prongs of forks, a flute, and knives, have been known to have been swallowed more or less readily, and to have passed with the greatest ease without producing any serious symptoms during their short stay in the stomach.

Symptoms produced by Foreign Bodies which are Arrested.—In addition to these fortunate and exceptional cases, there is a large number of others in which matters do not run so smoothly. As in the preceding cases, the stomach makes efforts at digestion; but these attempts are fruitless, and, as the body does not follow the alimentary

matters, it is arrested and really becomes a foreign body. Its mere presence suffices to explain the accidents which it produces, and which are not always proportionate to its physical properties.

When a foreign body has lodged in the stomach, the patient experiences an undefinable malaise, accompanied by dread and præcordial anxiety; he is found in the distressing condition which precedes vomiting, and which reacts very quickly upon the general condition. The face becomes pale and distressed. In proportion as the feeling of epigastric distress increases, the patient experiences a pain, which becomes more acute and intense. It is sometimes circumscribed, corresponding to the painful points in pleurisy and intercostal neuralgia. This peculiar condition is especially observed when the body is pointed and large, as in Labbé's case of the man who had swallowed a fork. Langius reports that a peasant, who had swallowed an oblong, pointed piece of wood, four knife-blades, and two irregular and serrated pieces of iron, was tormented by such violent pains that they led him to commit suicide. The bodies were found lodged in his stomach. Sometimes, on the contrary, the pain is dull and heavy, and extends from one hypochondriac region to the other. It is also accompanied by a feeling of weight when the body is heavy, such as bars of lead or large pieces of iron. One characteristic of this pain, which is sometimes noticeable, is its diminution under the influence of ingestion of food. We can readily understand the effect of the alimentary mass in such cases; it separates the foreign body from the wall by dilating the stomach, and by preventing its spasmodic contraction upon the irregularities of the object.

All pressure exercised upon the epigastric region produces pain. It also increases after eating, especially when the foreign body is pointed; this is due to the fact that the stomach is subject, at this time, to peristaltic contractions, which irritate the mucous membrane by pressing the irregularities against it. We thus account for the fact that a young girl, who had swallowed a hair-pin, suffered violent pains after each meal.

Pain is sometimes the only appreciable symptom, but it may be very slight even in cases of very irregular bodies. This is proven by the following observation made by Blake (Boston Med. and Sur. Journal, 1871):

Observation.—A girl swallowed a spoonful of broken glass, the largest pieces being of the size of a pea. All the foreign bodies were evacuated through the anus, without any other disturbance than violent pains in the epigastrium and umbilical region.

The suffering very often leads to other interesting phenomena. Such is, among other symptoms, the position assumed by the patients when they are seized with a violent attack of pain, with sensations of internal rupture, which increase under the slightest influences, such as a movement or full respiration; they instinctively endeavor to suppress them. In order to effect this, they breathe as gently as possible, without the intervention of the diaphragm, the intermittent contractions of which concuss the stomach. They thus unwittingly assume a characteristic position, which is found in a very large number of cases. The upper part of the body is carried forward and bent upon itself, and, in order to better insure the immobility of this region, they carry the hands upon the epigastric region. In some cases the patients assume other attitudes in order to effect the same purpose of immobilization. Some refuse to perform any movement, and experience great difficulty in respiration.

Others, like the lunatic of whom Ramon speaks, and whose history is now given, carried the body forward, the head backward, and the hands placed upon the epigastrium.

Observation.—Ramon, while making an autopsy upon a lunatic who had committed suicide, found a tin fork in the stomach, the prongs being turned toward the cardia and the handle toward the pylorus. This man stated that he had swallowed a fork five or six years previously, and very frequently complained of epigastric pain. "His walk, and habitual manner of holding himself while standing, confirmed this statement. The trunk was always held erect, and there appeared to be a difficulty in movement; the epigastric region was always projected forward; in speaking, he often endeavored to straighten himself more, and brought his hand involuntarily to the affected region. His face was then distorted, as if he were suffering from acute pain." (Ann. méd., 1845, T. II.)

If art or some other natural resource is unable to relieve these pains, they may embarrass the functions most essential to life, viz., respiration, deglutition, digestion, sleep, etc. Barnes reported a very striking example of the influence of the pain upon sleep, and of the instinct of these ingenious unfortunates.

Observation.—A mountebank, having swallowed a knife, the object remained in the stomach. It gave rise to very intense pains, so that the patient could only obtain a little sleep by lying down in supination. Digestion was very distressing. Gastrotomy was proposed, but was refused by the patient. (The Edinburgh Philos. Jour., 1825.)

This is a means of immobility which we may recommend in some cases. The instinctive necessity which preserves these unfortunates from pain makes itself felt even during digestion. This fact had not escaped the observation of the sagacious Labbé, who remarked that, during a certain length of time, Lausseure, the man who had swallowed the fork, was obliged to render himself perfectly immovable in a seat for several hours, until the stomach was empty, in order to facilitate his distressing digestion.

These are not the only phenomena of nervous origin. There are others which are rarer and also more serious, such as syncope, weak spells, and convulsive movements, which are observed at a longer or shorter period after ingestion. These accidents are not produced in the beginning, but are more frequently the termination of a paroxysm of suffering and præcordial anxiety. Fabrice of Hilden states that needles have been known to remain harmless for several days, and then to produce pain in the region of the pylorus, "with delirium and horrible convulsions." What is the cause of the syncopal attacks and epileptiform convulsions which have been observed? It is very difficult to answer this with precision, but the relations of gastric and cardiac innervation are so intimate that such facts do not appear surprising.

Next to the pain which is manifested under such numerous phases, vomiting is one of the most frequent symptoms. We may, if we wish, regard it as a natural effort to rid the organism of a foreign body which interferes with it. However this may be, it may occur at different periods, and assume the most strange and dissimilar characteristics, being sometimes continuous, sometimes intermittent. It produces expulsion of food or sanguinolent, bilious matters, and sometimes even of pure blood. Vomiting, usually preceded by nausea, sometimes appears shortly after the ingestion of the body. This is a matter of individual susceptibility, but it is

also, in certain cases, due to the nature of the foreign body. If the stomach is empty at the time of ingestion, if the body is sharp and irregular, if endeavors have been made to push it forward, there are many chances that vomiting will promptly follow. But in other cases we find it appearing a long time afterward, at a period in which the foreign body has been almost forgotten. Between these two extremes, there is room for an infinite number of intermediate cases which represent natural irregularities. In the beginning, the vomited matters almost always consist of food; these very efforts produce an irritation which keeps up the vomiting and renders it more and more painful. Matters pursue such a course if the foreign body is irregular, and if it irritates, excoriates, and ulcerates the walls of the stomach. The character of the vomiting then changes; the ejected matters become mucous, sometimes bilious and streaked with blood. These spots of blood are usually red, because the blood has not had time to be altered by the digestive juices. When this phenomenon occurs, it attracts the attention of the surgeon, who sees in it the effect of rupture of the mucous membrane by the irregularities of the body. The vomiting of pure or black blood, which has been reported by several authors, possesses a much greater gravity. This is a very grave symptom, only observed in cases in which life is endangered. In John Marshall's case, the symptoms produced by the ingestion of more than a pound of nails began with the expulsion of a basinful of blood, which was undoubtedly due to ruptures of the mucous membrane. The vomiting of blood, together with pain, constitute the sole symptoms of the strange ingestion, in the following case reported by Heymann (Arch. gén. de méd., 1834, T. I., p. 676):

Observation.—A shepherd dwelt with his children in a cabin, which was infested every night with a large number of mice. One of the children slept with his mouth open, and a mouse suddenly entered it. The child, by an involuntary movement of deglutition, pushed the mouse into the stomach; pain, vomiting of blood. At the end of forty-eight hours, the child passed a large mouse by the bowels; it looked as if crushed lengthwise, and its skin was denuded here and there. The child was ill for a long time, but recovered.

It is difficult to form a precise idea, from the accounts of the authors, of the nature of the black vomit which has been sometimes observed (Velpeau, etc). In Velpeau's case, among others, it occurred in an individual in whose stomach a fork had been lodged for a long time.

Was this coloring matter due to blood, or to some other cause? The observation of other facts and pathological anatomy justify us in the belief that this coloration is due to a change in the iron fork by the gastric juice and alimentary matters. In fact, this fork was passed in pieces, through the anus, at a later period; and in several autopsies of metallic foreign bodies lodged in the stomach, the inner surface of the mucous membrane has been found impregnated with a blackish mucus.

General Symptoms. Emaciation. Marasmus.—When the foreign body is not promptly expelled by the efforts of the stomach, as happens in some cases, it may produce the same effects in such a persistent manner as to endanger health, and even life itself. These disastrous results increase so much more rapidly, as anorexia is one of the ordinary concomitant symptoms. It is not unusual to find cases in which the unfortunate patients have gone several days without drinking, eating, or sleeping. Even in cases in which the intolerance of the stomach is less marked, emaciation rapidly develops, and marasmus is produced within a few days.

A very interesting relation of cause and effect here comes into play which produces these serious symptoms, and adds its action to that of the insufficiency of the absorbed matters: it is the alteration in the gastric, perhaps even in the intestinal secretions, and secondary to the mere presence of the foreign body, which leads to disorders, even in other parts of the intestinal tract.

Constipation and Diarrhœa.—Must we not look to these reflex changes for the cause of the constipation and diarrhœa which very frequently accompany the presence of foreign bodies in the stomach? Analogy leads us to think so. In the beginning, constipation is more frequently observed than diarrhœa. It has been attributed to the use of the narcotics which are usually administered in such cases, but it has also been observed in those who have not taken opium. It may alternate with a diarrhœa, which usually presents no peculiarity, except in a few cases, in which the passages were very black, and had a ferruginous odor. These phenomena were due to alteration of an iron fork by the digestive fluids.

Such are the principal symptoms of foreign bodies in the stomach. We must also mention the intense thirst which often exists. All these symptoms do not occur simultaneously; they are, on the contrary, rarely united, and are not produced continuously. They may follow one another, disappear, and then reappear, after a variable lapse of time, in such a manner that there are true intermissions in the primary symptoms. It may even happen that larger bodies, like forks, remain for a very long time without manifesting their presence by any phenomena, and are revealed by acute symptoms, after a long lapse of time. In Labbé's case, Lausseure had no serious symptoms for nineteen days; after the primary symptoms, there was a period of calm sufficiently complete to enable him to resume his former occupation.

In conclusion, the symptomatology of foreign bodies in the stomach presents nothing characteristic. It is a combination of subjective symptoms which are common to other affections, and which are very insufficient for a diagnosis. There are no objective symptoms in the very large majority of cases. It has sometimes happened that surgeons have been able, by relaxing the walls of the abdomen, to detect the foreign body which formed a tumor in the epigastric region. But I can give the reader an idea of the insufficiency of this measure, by recalling the uselessness of the efforts of a number of surgeons to detect spoons or forks. Finally, we must mention the bruit produced by succussion, which is noticed in some cases of multiple foreign bodies. Such are, for example, Foville's case of the game of dominos, and that of Cassandre, of Nancy, who proved to the spectators the reality of his feats, by allowing them to listen to the noise of the pebbles, produced by percussion of the epigastrium.

CHAPTER IV.

THE CONDITION OF THE FOREIGN BODIES.

A FOREIGN body introduced into the stomach may pursue one of the following courses:

1. It may be expelled by vomiting.
2. It may pass through the pylorus.
3. It may remain indefinitely in the stomach, produce inflammatory symptoms around it, and be expelled through the walls of the organ.

In point of frequence, the second category includes the much larger number of cases, and the others really contain only exceptional instances, with which, however, it is necessary to become acquainted.

1. FOREIGN BODIES IN THE STOMACH EXPELLED BY VOMITING.—The study of the symptoms has enabled us to determine the frequency of the vomiting spells and their persistence. I will not dwell now upon those cases in which nature acts alone, without surgical intervention, reserving the discussion of this point to the remarks on treatment. This manner of natural termination is rarely observed, and we hardly find any authentic examples. Some authors have endeavored to explain this fact by the very nature of the swallowed body, which has usually been a foreign body of the œsophagus before entering the stomach. They believe that the cardia and œsophagus are rarely found in such a condition that the passage can take place easily. Without denying these statements, which are true with regard to misshapen bodies, we may also call attention to the spasm of the œsophageal canal and the inevitable irritation after ingestion of these objects. Finally, we may assume that, after a long time has elapsed, the functions of the stomach are not intact and expulsion has become very difficult.

Nevertheless it is sometimes observed, as in the following case, after a very prolonged stay in the stomach. It is true, however, that the circumstances under which expulsion occurred are not ordinarily met with.

Observation.—Adler reports that a child, æt. three and a half years, swallowed a piece of copper, which he was unable to pass. From this time on he vomited all solid food and experienced a continuous pain in the epigastrium. At the end of three months the child precipitately swallowed a piece of bread, which lodged in the œsophagus; he became unconscious, and his mother restored him by shaking him, whereupon he vomited, at the same time, the morsel of bread and the piece of copper, which was covered with a thick layer of mucus. Recovery. The coin had remained 102 days; it was blackened and the figure was somewhat effaced.

Despite the unfavorable presumptions concerning the termination of the symptoms by vomiting the foreign body, we must remember that the latter may, by chance, be placed in such a position which will enable it to retrace the path by which it entered. Mention has been made of a fork which was expelled in this way, and we have seen, in the chapter on foreign bodies of the œsophagus, the history of a girl who, having swallowed a bone, had such convulsive movements that she broke between her teeth the glass which she held and swallowed a piece. Shortly afterward she vomited both foreign bodies. Pins and needles have also been expelled in this manner; but this is not the usual way, and this ter-

mination is not always as fortunate as it would seem. In fact, it has happened that a pointed bone, which was expelled by an act of vomiting, was unfortunately placed crosswise in the œsophagus, and gave rise to serious accidents. This recalls another fact mentioned by Hévin, relative to a girl who was suffocated by a large piece of meat which obstructed the œsophagus after a vomiting spell.

2. The Foreign Body may engage in the Intestines.—It has been stated in the preceding pages that the large majority of the foreign bodies follow this course, and pass through without remaining any length of time. It is also the most frequent mode of termination for those which have undergone a more or less prolonged stay. Nothing is more variable than the duration of this arrest before the body engages in the pylorus. If the first digestion has failed, renewed efforts will be produced in the second, so that the arrested body is incessantly impelled to follow the products of digestion in their normal course. Hence it is not surprising to find that the obstruction is removed, a few days after the ingestion, without any active interference. Such a fortunate termination requires a combination of conditions which are already known, viz., regularity and narrowness on the part of the foreign body, and tolerance and a certain amount of indolence on the part of the stomach. Finally, we must add to these conditions the possibility of alimentation, which is an important element in the passage, and which facilitates and almost entirely performs it. As these conditions are not always united, the foreign body may remain a long time before passing the pylorus, and there are cases in which, despite the natural modifications of the object and the parts, the passage is never effected.

In fact, whatever time has elapsed since its ingestion, we must not entirely give up the hope of seeing the foreign body pass into the intestines; the intermediate time is often measured not only by days, but even by weeks and months. A review of the cases shows that it has taken more time for certain foreign bodies to pass the pylorus than to traverse seven metres of the intestines, including the place of intestinal election, the ileocæcal valve. This termination, without any bad symptoms, has also been observed for bodies which appeared, at first sight, incompatible with the dimensions of the pylorus and the very abrupt curve of the first part of the intestines. We refer to flutes, forks, heads of awls, spoons, nails, table-casters, and many others too numerous to mention. Among twenty-three known cases of ingestion of forks, they have succeeded nine times in passing the pylorus.

We may also admit that in some persons, as stone-eaters and other mountebanks, the pylorus enlarges after a certain length of time. This fact has been directly observed in the notorious Cassandre, who for forty years proved the elasticity of his intestinal tract by swallowing pebbles and mice. The pyloric orifice, although manifestly dilated, had nevertheless permitted the retention of thirty-two pebbles which were found in the greater cul-de-sac of the stomach. It is very curious to see this capricious orifice, which is so frequently overcome by the most remarkable foreign bodies, make a long resistance before permitting the passage of bodies, whose texture and nature are much more like those of food than the former. Is it not very anomalous to find a body, which is as indigestible as a spoon or knife, pass through the pylorus in a few days, while a piece of leather, gutta-percha, or a fragment of lung may remain more than six months in the fundus of the stomach? Even Fabrice de Hilden had observed cases of this kind, to which numerous modern cases may be added.

Without doubt the solid consistence of some, their localized pressure, the *point d'appui* which they give to the walls in exercising a continuous series of synergic efforts, the resultant of which produces progression toward the pylorus, throw some light upon the question and enable us to understand its occurrence. But in admitting this mechanical hypothesis as proven, it still remains for us to determine how bodies of animal origin may be subjected for such a long time to the action of the digestive fluids.

From the preceding remarks, it follows that the pylorus presents a very firm and capricious resistance to the passage of foreign bodies into the duodenum, and that, when once engaged, they pass very readily beyond the constriction. Though this fact is verified in the majority of instances, it is reversed in a certain number which the surgeon may recognize, and in which the passage is not effected. If a foreign body, with varying dimensions, presents itself at the pyloric orifice, it may engage in the most unfavorable one, and produce grave, and sometimes fatal, symptoms by its mere presence. At other times the pylorus finds itself in conflict with insurmountable obstacles—a mass of needles, for example—and will be overcome, despite all its efforts. Causes of this nature have been the origin of the fatal accidents in the following cases:

Observation by John Marshall (Dublin Med. Press, 1852, and Gaz. méd. de Paris, 1852).—*Needles in the stomach, with obstruction of the canal.*—A woman, who was forty-one years old at the time of her death, had had six children, the youngest being born in 1844. In November, 1842, two weeks after her fifth confinement, she vomited a small amount of blood; she then became unconscious for forty-eight hours, the pupils being dilated and the pulse hardly perceptible. She recovered slowly, and her constitution remained feeble since that time. In the autumn of 1845 she felt pain in the epigastrium and left groin, accompanied with frequent vomiting. A hard tumor was felt in the groin, of the size and shape of a placenta, and moving transversely when the patient turned from one side to the other. The patient had noticed this for several months; when she touched it, vomiting was produced, although palpation was not painful. She complained, in addition, of a pain between the shoulders, shooting pains in the left breast, and extreme flatulence. The menses were suppressed for three months, and she believed herself pregnant. Constipation; continual vomiting, often streaked with blood; considerable emaciation and debility. Despite these symptoms, which appeared to threaten approaching death, the woman, nevertheless, began to recover, although she had taken nothing but a large quantity of brandy for two days. For five years she continued to enjoy a tolerable degree of health; but pains recurred from time to time, and the habitual constipation and the œdema of the face and knees showed that health was not entirely restored. The menses did not return.

In October, 1850, all the former symptoms (vomiting, etc.) returned, and she died, after having suffered from these symptoms for three weeks.

Autopsy.—The pyloric extremity of the stomach descended to the pubis, and resembled a champagne-bottle in appearance. The pancreas was not in its natural position. The duodenum was lying partly under the sigmoid flexure of the colon. The liver was large and pale, the bladder full, the cæcum and colon very small. No signs of peritonitis. The stomach contained, in the lower part, nine ounces of needles, of a reddish-black color, but not rusted, all of them bent or broken, and very sharp. The duodenum contained a mass of needles united into a sort of very solid bundle. They were of different sizes, like those in the stomach, and entirely obliterated the intestinal tract; they weighed a pound in all.

Another author reports the case of a child, who died from swallowing a coin, which became lodged transversely in the pylorus. Death occurred from inanition, after the most frightful symptoms. These cases are, fortunately, very rare, and they only serve to show the possibility of accidents after the body has engaged, and to slightly moderate the favorable

opinion which we form concerning the elasticity of the pyloric orifice, from seeing flutes, etc., pass into the intestines within two or three days.

3. Foreign Bodies may remain in the Stomach for an Indefinite Period.—When the efforts of nature or therapeutics have not succeeded in causing the expulsion of the foreign body, or in making it pass into the intestines, we must expect it to remain in the stomach for a long time. This is observed, indeed, even in those cases in which inflammatory changes supervene, which usually do not appear until after quite a long period of arrest. It is to be remarked that the majority of observations upon foreign bodies in the stomach have been made upon autopsy, though their existence had been previously unknown, and nothing had arisen to arouse suspicion.

Lunatics may swallow, even for years prior to their death, large foreign bodies, which remain in the stomach without attracting attention. At the autopsy of a lunatic, who had attempted suicide several times, a fork was found in the stomach, which had been swallowed several years previously.

The list of foreign bodies thus discovered is interesting, although not very long; it includes coins, pebbles, pieces of wood and iron, forks, spoons, nails, bullets, etc., all of which objects are large and irritating. Two conditions must obtain, in order that the bodies should be tolerated —on the one hand, a certain regularity; and, on the other, a favorable condition on the part of the stomach. As it very rarely happens that these conditions—especially the second—obtain, their stay is not very long. Few organs will readily tolerate the presence of nails, wood, etc.

Prolonged Stay with Persistence of the Symptoms.—The primary symptoms may also persist with their rapid reaction upon the general condition, which is soon put in jeopardy. The formula employed by the older authors to characterize the various phases of the affection is always the same. An individual swallows a foreign body, which falls into the stomach, where it produces serious symptoms, such as vomiting, pain, convulsions, syncope, and obstinate constipation. These symptoms usually continue until death, which occurs, after a variable length of time, from marasmus and inanition.

The progressive emaciation runs a frightfully rapid course. In some cases a primary improvement and temporary tolerance are followed by the same symptoms, whose termination is also fatal. Death, in such cases, may occur after the lapse of months or even years, the accident often giving rise to unfortunate relapses.

Changes in the stomach from prolonged stay of the foreign body. Alterations in the secretions.—However terrible the symptoms may appear after a more or less prolonged presence of the foreign body in the stomach, we must nevertheless remember that, under some circumstances, these symptoms are much milder, and even absent.

The stomach is sometimes the seat of a slight gastritis and diffuse redness; at times it presents ulcerations, which have been observed in the autopsies of stone-eaters. But are the foreign bodies the only cause of these lesions? Are we not justified in doubting this with regard to some cases, and of attributing the gastric ulcers as much to alcoholism as to the action of the foreign bodies?

The circumstantial details given by authors concerning the habits of these acrobats furnish a proof of this. Cassandre, for example, could only relieve the pains which he experienced in his stomach, after the ingestion

of pebbles and mice, by very copious libations, which produced temporary insensibility.

On the whole, in these cases of tolerance or of their presence with gastric symptoms, the lesions of the stomach are very slight. It is often even astonishing to see how little the organ is involved, even if the economy is profoundly affected and the emaciation progresses rapidly. It is very probable that the properties of the secretion are insensibly changed; that it loses its qualities after a certain length of time, from the mere presence of the foreign body. It matters little whether the action is direct or reflex; the change exists, and the economy manifests its effects by the general ill-health.

The solution of foreign bodies in the stomach.—The ancients attributed a great rôle to the nature of the foreign body which was swallowed, and thought that all those which were metallic could become injurious by their solution in the digestive tube. To-day these questions are less mysterious than at the period in which Hévin, Vierus, Bartholin wrote, and we know that the dangers of ingestion of coins, etc., are almost entirely illusory, and the prognosis of slight gravity; furthermore, certain surgeons believe that they have observed the efficacy of iron instruments upon the improvement of the general condition. Moissenet has seen a mountebank whose malarial anæmia disappeared after he had swallowed a number of knives. It may exceed the limits of a useful study, but this fact proves better than any other how far removed our ideas are from those of an author mentioned by Hévin who spent a great deal of trouble in collecting the symptoms which the solution of an ingested piece of iron can produce. This question is interesting, when confined to its just limits, because it touches upon diagnosis and treatment: upon diagnosis, by the symptoms which this solution may produce; upon treatment, by the greater or less utility which the surgeon may derive from a knowledge of these facts.

These authentic examples prove the action of the gastric juice upon metallic foreign bodies, copper or iron, especially the latter. If we consult the authors, we will be astonished at the infinite variety of these phenomena. In one case, a coin is vomited at the end of twelve days, and is blackened; again, an acrobat passes perfectly clean-scraped coins, by the bowels, upon the day after their ingestion. This is a striking anomaly, and we could more readily understand the reverse, as the sulphates are found in the lower parts of the intestine. But perhaps these cases of burnished coins have been fictitious, and the credulity of authors may have been imposed upon. A black discoloration has been observed in almost all cases in which iron or bronze coins were swallowed. This is due to sulphide of iron or copper, or to other less well-defined combinations. These black products of metallic origin are found around a large number of foreign bodies which have remained for some time in the organism.

The peculiarity of the present case is that these products of the action of the digestive fluids or foods do not remain in one place, but are most frequently combined with the passages, which thus become blackened, and sometimes with the vomit, which assumes a characteristic color.

In autopsies, therefore, we always find the gastric mucous membrane covered with a thick, blackish mucus, and the coloration may even be prolonged into the intestine. These spots may be more circumscribed and look like rust, as in the following case:

Observation.—In 1825 Sonnié-Moret made an autopsy upon a woman who had introduced numerous foreign bodies into the different canals of the body, causing her

death. No foreign bodies were suspected in the stomach during life, but in it were found eleven packages of nails bound together, and some pieces of brass from a pair of suspenders (160 grammes). These objects had a black color. The brass had been partially dissolved, and the ends of the brass wire were thinned and very sharp. The iron was more deeply attacked, its surface presenting ridges and notches, and some of the nails had become converted, so to speak, into threads. The inner surface of the stomach was pale red with a few scattered spots of a deeper red; the greater cul-de-sac had a brownish tinge, and there were some spots of the same color near the pylorus. The external surface presented upon the hypertrophied pyloric portion some rust spots, the largest of which was found along the lesser curvature about two inches from the pylorus, and was half an inch long and three inches wide. At this spot the muscular coat was softened as far as the mucous membrane, but the latter presented no change. The large intestine contained black ferruginous matters. All these lesions were produced within two months. (Sonnié-Moret: Arch. gén. de médecine, 2e Série, 1835, T. VIII.)

The black discoloration of the stomach is observed upon the surface of the mucous membrane for a certain length of time after the passage of the foreign body into the intestine, as is shown by several autopsies. However, this color is not peculiar, since it is also found in those cases in which pieces of wood have been arrested.

I do not believe that there are any examples of complete solution of a metallic foreign body in the stomach. As a rule, only a partial action is produced, but the effect of which may be very effective in enabling irregular, and large bodies to pass through the pylorus.

Inflammatory Symptoms produced by the Presence of Foreign Bodies in the Stomach.—I now enter upon a chapter of abdominal pathology, which is extremely interesting and rich in curious examples. Inflammation occurs here in its most varied forms and with various terminations. Hence the necessity, in order to understand these facts, of arranging these isolated cases in groups, which differ very little from those adopted by M. Peter.[1]

1. Non-phlegmonous tumors.
2. Phlegmonous tumors.
3. Fistulæ.

1. Non-phlegmonous Tumors.—These are tumors formed by the foreign body itself, which is situated in the abdominal walls. Their production requires a series of useful and benign inflammatory phenomena, without general reaction or acute symptoms. It is rare that any acute pains are noticed. The simple nature of the phenomenon depends upon an important factor, viz., the shape of the body; this fact is so marked that very pointed bodies have been known to pass through the walls of the stomach without producing any inflammatory reaction. These cases are very numerous and curious.

Observation.—Benivenius, quoted by Hévin, states that a woman swallowed a large copper needle, which remained in her stomach for two years, and caused very acute and almost continuous pains. These pains threw the patient into a condition of marasmus and extreme exhaustion. The physicians had in vain administered a large number of remedies for a long time. Finally, the needle appeared externally in the epigastric region through a narrow opening which it had made in the stomach and integuments. The patient was freed of her pains as soon as the foreign body was withdrawn, and the health was very quickly restored.

Mechanism of the formation of non-phlegmonous tumors.—Needles have been known to make their way out at the level of the xyphoid

[1] Arch. gén. de médecine, 1855, 4e Série, T. VI.

appendix without suppuration. If the body is very sharp, like those under discussion, the pressure due to the contractions of the organ will produce immediate perforation of the stomach and even of the abdominal walls. If the body is oblong and blunt, like a fork, the pressure produced along its long axis will give rise to the formation of an external projection, which usually appears in the left hypochondrium, and raises the abdominal wall before it. We must not forget that this pressure is also produced posteriorly, and this fact explains the deep pains which are produced on palpating the tumor and moving it from side to side. The patients themselves are well aware of the time at which the perforation is produced. The axis of the foreign body was previously parallel to that of the stomach, and the symptoms were less intense; suddenly the pains increase after an effort at vomiting or some other cause, and the patient feels plainly that a change has taken place. When the pressure against the wall is somewhat more prolonged, it produces a slight plastic inflammation at this point, the effect of which will be to cause adhesion of the layers of the peritoneum to one another. Then the mucous membrane becomes ulcerated at the point at which the pressure is greatest, and the foreign body passes out through this way, and lodges more or less obliquely under the skin. These non-phlegmonous tumors are formed in the midst of the meshes of the infiltrated cellular tissue, their usual site being above the umbilicus and slightly to the left. Examples of non-phlegmonous tumors are infrequent, and it would be difficult to find more than eight or ten cases.

What becomes of the foreign bodies which are thus half encysted in the cellular tissue? In the first place, we may state that they are very rapidly separated from the stomach, and that the ulceration through which they have passed closes up without any acute symptoms; the entire process does not, as a rule, occupy a long time.

When the non-phlegmonous tumor is formed, it may remain stationary for some time, after which the foreign body may:

1. Perforate the wall directly or by means of an abscess.
2. Travel a certain distance in the abdominal walls.
3. Give rise to a phlegmon or to peritonitis.

1. *Perforation of the Abdominal Wall.*—If the object has a sharp end, it perforates the wall directly. Palpation will also produce characteristic acute pains. If the body is less sharp, the perforation will be slower, and the surgeon must often intervene in order to aid nature. As soon as expulsion has occurred, the symptoms improve and suppuration or inflammation do not occur.

Observation.—Perforation of the abdominal wall by a needle (Schmidt's Jahrbücher, 1877, V., 173, Stiehler).—Upon Sept. 11, 1875, a child, one year old, while playing, swallowed a crochet-needle, 0.105 mm. thick, 8 mm. long, and terminating in a round glass head; passed a tolerable night. Upon the following morning, as the child complained and gave signs of distress, it was suspected that it had swallowed a needle, which remained undiscoverable despite all attempts at search. During the entire week the child remained quiet when the thighs were flexed, whether in a sitting or recumbent position. All other positions gave rise to cries and distress. Diminution of appetite for food and drink; liquid stools; scanty urine; no vomiting.

Sept. 19. The point of the needle can be seen and felt under the skin about two and a half centimetres below and to the left of the xyphoid appendix. Impending perforation of the anterior wall of the stomach; violent pains; incision of the skin; escape of a drop of pus and extrusion of the needle. Stiehler enlarged the wound with a bistoury in order to allow the passage of the head of the needle. Occlusion of the wound with the finger at the moment of extraction. Suture; dressed with adhe-

sive plaster. One and then two spoonfuls of coffee, and later of skimmed milk, were administered every ten minutes. Dorsal decubitus; cold applications to the epigastric region. The distress persisted for some hours after the operation. Quiet sleep the same night. No emesis; stools liquid, then normal. No discharge from the wound, and the suture was removed upon the third day. The appetite returned, and, by the 9th of October, the child was cured.

2. *Migration.*—The body may travel a certain distance along the abdominal walls; this occurence is common to all foreign bodies of the intestinal tract, and attention had been called to it by Peter. Although exceptional, these cases have been very well observed, and the laws governing them are well known. The direction assumed by the foreign bodies is always the same, viz., obliquely downward and outward. This tendency to travel downward, which is common to so many foreign bodies in the cellular tissue, may be attributed to the effect of the force of gravity, and the anatomical arrangement will enable us to understand their obliquity, the foreign bodies usually appearing in the region of the groins. Where are they situated? Are they beneath or above the aponeuroses? It is probable that they pass in front of the aponeuroses in the superficial layers. Further observations are necessary, however, to clear up this point in pathological anatomy. When they have arrived at the spine of the ilium, the migrating bodies are arrested, remain here for a certain length of time, become stationary, and then produce a phlegmonous tumor, through which they escape.

3. *Phlegmon. Peritonitis.*—The body may give rise to the formation of a phlegmon or peritonitis. It may remain stationary for a very long time before producing the eliminating inflammation, and the latter occurs after an extremely variable period. It is most frequently produced by palpation, blows, or surgical interference, and the case then becomes identical with the following. Finally, the perforation may gradually produce death.

Observation.—Hervez de Chégoin observed a patient who died of exhaustion following diarrhœa, and in whom a tooth of a comb was found to have perforated the walls of the stomach; it was arrested in such a manner as to project upon the inner and outer surfaces of the organ. (Société de Chirurgie, 1857.)

2. Phlegmonous Tumors.—Their causes are the same as those of non-phlegmonous tumors, that is to say, the pressure of the stomach upon the long axis of the foreign body. But circumstances have changed; the stomach and individual are not so tolerant, and the pressure is more irregular and diffuse. As in the previous case, the onset is characterized by an increase in the appreciable symptoms. The pain sometimes becomes so intense that the patients are forced to give utterance to cries. It greatly resembles the pain of pleurisy or pneumonia, but it gradually increases until the formation of pus. A tumor appears at the same time in the left hypochondriac region, and is diffuse, slightly reddened, hard in the centre, with superficial puffiness, painful on pressure, and giving rise, when explored for fluctuation, to deep pains in the kidneys. If we add to this collection of symptoms, the fever, anorexia, insomnia, and anxiety, we will form an idea of the miserable condition of these unfortunates who were previously emaciated from the prolonged presence of the foreign body in the stomach. For these reasons some patients are unable to carry this process of inflammatory expulsion to a favorable termination, and die prematurely from some complication. If death occurs, it may be due to a complication of this eliminating process.

The pressure, instead of acting upon the antero-posterior axis of the object, may act obliquely upon the body in all directions, so that its ends are at a distance from the wall; then the weakest point, corresponding to some projection of the foreign body, will yield, and perforation will occur, the pressure still continuing to act. Hence intense peritonitis develops. I borrow a case of this kind from Malrutz.

Observation.—An autopsy was made upon a woman in order to discover the cause of death. The stomach was found to contain a knife, whose blade was about four inches long. It had pierced the stomach about three fingers' breadths from the superior orifice, and the point projected an inch and a half through the opening which it had made.

In one case, a long metallic needle perforated the liver; in another, the prongs of a fork passed through the posterior wall of the stomach. Everything depends upon the position of the foreign body, since very favorable eliminating phlegmons are produced when the prongs of the fork are directed forward, while death terminates those cases in which they are directed backward. This process is sometimes interrupted by various accidents which carry off the patients at times, as in the following case, reported by W. Watson (Lancet, 1868):

Observation.—A girl, æt. 11 years, had complained for eighteen months of pains in the epigastrium, and was subject to epileptiform attacks for a year. She was found dead in bed, undoubtedly in consequence of a convulsion. At the autopsy the stomach and liver were found to be bound together by adhesions. Upon destroying them, a needle, one and a half inches long, was found to have traversed the stomach, and to have penetrated the liver to the depth of half an inch.

The following case, reported by Lambron,[1] is even more convincing. This author reports a case of phlebitis of the vena porta, produced by a fish-bone, which passed through the pyloric end of the stomach and the head of the pancreas, and was imbedded in the trunk of the superior mesenteric vein.

These are useful indications with regard to facts which are very little known, and whose study will be useful, because foreign bodies in the stomach are not beyond the resources of art, if it is possible to modify their situation, and if we can abort these phlegmons by following the course which nature points out to us. Labbé's observation of the man with the fork presents one of these cases of aborted phlegmonous tumor, undoubtedly due to the chance displacement of the fork.

If we endeavor to define the various phases of this inflammatory process, we may divide them into four different heads. In the first, the foreign body exercises excentric pressure; under this influence, which is very prolonged, the adhesion of the layers of the peritoneum is produced in the second period. When this has been done, the chances of danger are removed, and the ulceration of the walls of the stomach occurs insensibly, while the external infiltration increases; this is the third period, and is accompanied by high fever and intense pain. All these symptoms disappear during the fourth period, which includes the formation of pus in the phlegmon and the passage (usually partial) of the foreign body into the cavity of the abscess. Such is a concise statement of the phenomena

[1] Arch. gén. de méd., 1842.

referred to in the observations of authors. I will report one in support of these theoretical considerations:

Observation by Van Andel (Gazette hebdomadaire de médecine et de chirurgie, 1866, p. 79).—A woman, Ch. J. C., æt. sixty-four years, who was suffering from melancholia, was admitted to the Zutphen Lunatic Asylum on Aug. 31st. A few days prior to her admission she had swallowed a silver fork. She wished to follow the recent example of a woman who had committed suicide by swallowing a similar article, and in whom gastrotomy was performed, followed in a few days by a fatal termination. When Ch. J. C. was seen, she was very calm, and expressed a desire to be operated upon as speedily as possible. Repeated attempts were made to recognize the presence of a foreign body in the stomach. The shape of the body and the history left no doubt that the stomach contained a fork; the prongs were directed forward and upward, the handle situated a little backward toward the pylorus. No complaints, no pain, but a feeling of epigastric distress. The general or local condition of the patient presented no serious symptoms, and no active treatment was adopted. On the 6th of December the points of the fork, which had been felt with the fingers, were no longer accessible to palpation, and a tumor, a little larger than the gravid uterus at the fourth month, was felt upon the left side of the abdomen above the umbilicus; spontaneous opening on June 9th, with exit of fetid and brownish fæcal matter. The foreign body could not be discovered. June 12th, the four prongs of the fork appeared at the fistula for two-thirds of their length. Two incisions were made on each side of the prongs, in order to extract the fork, which had a perpendicular direction. The handle was covered with fetid fæcal matters of a brownish color. On the ensuing days, exit of fæcal matters, which gradually diminished until July 14th, when cicatrization was complete.

Observation.—A young man swallowed an open knife; he felt, at first, a very acute and intermittent pain in the left hypochondrium under the false ribs. A tumor appeared at this point a year and a half later, and broke down into an abscess. This was opened by a surgeon, who withdrew from it the knife, which presented by the point. Very rapid recovery.

There are also some cases on record of successive multiple phlegmons which terminated in recovery.

Observation.—In 1619, a hale, but insane vine-dresser, sixty-nine years of age, living near Montmorency, swallowed a hone, or butcher's steel, without knowing it. He gave no sign of pain after swallowing it. At the end of five or six months, a large abscess developed in the right hypochondrium, in which the steel was found, together with considerable fæcal matters. It was skilfully withdrawn, and the wound healed within a week. This accident was followed by another equally grave one; the same man found the leg of an iron saucepan, which he carried to his mouth and swallowed. He made no complaint, despite the painful sensations which a body so hard and irregular would produce in the stomach. The same sequel occurred as the first time; six months afterward an abscess developed in the left hypochondrium, through which the foreign body escaped. This abscess also healed up very rapidly. But this did not constitute the last extravagance of the vine-dresser. Shortly afterward he swallowed a pocket-knife together with its case. The knife escaped at the end of several months, through an abscess which formed a little above and to the side of the lumbar vertebræ. The case had rotted, and the knife, whose point presented first, pierced the abscess as the man was bent over while working in the field. (Mémoire de Hévin.)

The following case, reported by Bryant, is interesting in this respect:

On the 10th of March, 1873, a lunatic swallowed a piece of thick iron wire. Some doubts were entertained as to the truth of her assertion, on account of the mildness of her symptoms; but two months later (May 11th) a tumor was discovered to the right of the umbilicus. This rapidly increased in size, and opened on May 20th; one end of the iron wire presented in the wound. Dyer removed it, and recovery rapidly occurred.

Such cases are numerous. The inflammatory process has terminated in this manner, in foreign bodies, such as knives, fish-bones, stalks of

grain, etc. The mechanism is simple, and is similar to that which has been adopted for the past twenty years, in proceeding from without inward, in exploring for an abscess of the liver. How do these phlegmons terminate? As we shall see, they sometimes attain a considerable size; they are usually circumscribed, and suppurate spontaneously, or the surgeon interferes, to put an end to the suffering.

This is perfectly natural and readily understood, but the strange peculiarities which are sometimes observed are not so clear. And, first, why does not the pus burst into the stomach, since it may travel along those portions of the foreign body which are very often enclosed within it? If we argue, from the rapid closure of the perforation after the body has been completely expelled, and from the obstruction produced by the foreign body itself, if it has passed out partially, we must remember that this point in the pathogeny of these phlegmonous tumors is very poorly understood.

In the second place, the most conscientious authors never mention the final issue of gastric substances, mucus or chyme, after these phlegmonous tumors have opened, whether artificially or spontaneously.

This fact is sufficiently explained by the rapid obliteration of the opening in the perforated organ. But how can we explain the cases mentioned by others, in which pus was present together with substances of a stercoraceous odor and character?

I only see two plausible reasons for this symptom:

1st. The possibility of a phlegmon in which the transverse colon takes part, and whence the fæcal matters issue, as in Van Andel's case; 2d, the mere proximity of an inflammatory collection to the large intestine will suffice to explain the odor of the substances furnished by the abscess.

To judge from certain facts, a phlegmon situated in the lower part of the stomach may give rise to circumscribed peritonitis, which may open into the large intestine. A knife has been known to enter the colon in this manner. The following observation is also in accordance with this statement:

Observation.—A child, five years old, swallowed a shoe-buckle. Syncope; violent convulsive movements, especially in the region of the stomach. Castor oil and an emetic were administered. Very sharp pains in the stomach; gastric colic. Two years elapsed, when a painful tumor of four fingers' breadth appeared in the right hypochondrium, extending toward the epigastrium. Leeching, emollient applications. Great improvement of the gastric pains within two weeks. *The tumor disappeared after a purulent diarrhœa.* The buckle was not found; recovery was complete.

It is evident from these considerations that the sagacity of observers finds ample scope in those difficult cases in which an unwarranted and bold practice may become dangerous. The surgeon is often confronted by collections of whose origin he is ignorant, and of which the patient himself is sometimes unaware; small details must then guide him in his practice. If he opens an abscess in this region, he should carefully explore the collection with the greatest precautions, in order to inform himself with regard to its origin and also with regard to the progress of the cicatrization.

3. Formation of Fistulæ.—After what has been said with regard to phlegmonous tumors, a few words will suffice with regard to fistulæ, which follow the former in all cases. The track of the abscess is oblique, and the foreign body may not present at the orifice, being retained by some part or by shreds of aponeurosis. These fistulæ are especially observed when the abscess follows a phlegmonous tumor which has developed around a migrating foreign body.

Observation.—A child swallowed a stalk of wild barley. A phlegmonous tumor appeared three days afterward in the right hypochondrium, which was opened ten days later. At this time the foreign body passed from the stomach into the abdominal wall. The fever and pain persisted. The foreign body kept on moving during this time, and, finally, the abscess appeared in the region of the groin. The fistulous abscess persisted until the body was extracted.

These fistulæ have a characteristic appearance; they present externally one or several orifices like a hen's anus, which open at the top of a fungous granulation. The secreted pus is at first frankly phlegmonous, and then becomes serous. When the attention is not attracted by the history or by exploration, the fistula may persist for a very long time until art intervenes to assist nature. Recovery will ensue as soon as the foreign body ceases to keep up the suppuration, unless the long duration of the fistula has produced extensive induration of the cellular tissue, the resolution of which is always slow and demands appropriate treatment.

Death caused by Foreign Bodies in the Stomach.—This manner of termination is rare in foreign bodies of the stomach; but as such cases are very striking, they have been carefully collected by surgeons.

There is no case on record of death occurring primarily, in the midst of acute symptoms. It is almost always secondary, and caused by the pathological process whose various phases I have studied.

Death occurs from general or local disorders. In the first place, it may occur as a fatal sequence of emaciation and the more or less complete inanition observed in certain patients.

Observation.—Holmes reports that he examined, together with B. Brown, the body of a young woman, æt. eighteen years, who suffered from a tumor in the epigastric region, and who frequently vomited after meals. She gradually grew weaker, became prostrated, and died.

The cavity of the peritoneum contained a few ounces of purulent serum and the signs of peritonitis were present. Upon opening the stomach, it was found to contain a large compact mass of hair and string, filling the organ in great part. A small portion was engaged in the pylorus. The hairs were long and black and united to one another by the string and dry alimentary particles; the mass measured six inches in length, three-fourths of an inch in thickness, and two and a half in breadth. Another mass occupied the upper part of the duodenum and the commencement of the jejunum. This portion of the intestine was considerably dilated. This mass contained fewer hairs and more oakum; it was fourteen inches long. (Pollok: J. de méd. et chir. prat., 1852.)

In such cases death is always very slow, and only occurs after the lapse of years. Forestus reports that a patient died in consequence of the ingestion of a sound which a barber dropped into his stomach. Death did not occur until after the lapse of two years; the patient was in a condition of extreme emaciation.

In the second place, the perforation of the stomach is the cause of the largest number of the cases of death, whether it occurs at an early period or follows the beginning of an inflammatory process. The patients are carried off by peritonitis in both cases. When this appears, the issue is fatal, unless, being stopped in time, it may be circumscribed. Unfortunately, it is usually beyond the resources of art, because its cause is unknown. Some cases, which are almost all analogous, will give us an idea of the subject.

Observation.—Bucknill observed an insane epileptic, æt. twenty-two years, who died of peritonitis. The stomach contained a perforation larger than a shilling, colored black, and with ulcerated borders, which was situated in the lesser curvature

of the stomach. General peritonitis. Upon opening the stomach, it was found to contain a mass weighing four pounds, and composed entirely of cocoa fibres and pieces of twine. The mucous membrane was healthy, except at the ulcerated spot. (Trans. of the Path Society.)

Observation.—Poland saw an autopsy upon a young idiot, whose stomach contained two pounds eight ounces weight of foreign bodies, and who died from a perforation of the anterior wall of the duodenum. The stomach and intestines contained a mass of spoon-handles (31) five inches long, four half handles, nine nails, half of an iron heel, a screw, and four pebbles.

CHAPTER V.

DIAGNOSIS AND PROGNOSIS.

I NOW approach one of the most intricate and least definite points in the question. The diagnosis is either made in advance, so to speak, by the clinical history, or the latter is wanting, and then the problem becomes very difficult. We can scarcely find an authentic case in the entire literature in which the diagnosis has been made in the absence of a history. It is sufficient to mention their value as an element in diagnosis ; unfortunately their utility is more restricted than we would believe, because a large number of the unfortunates, who swallow foreign bodies capable of being arrested in the stomach, that is to say, very large bodies, are unconscious beings, either drunkards, lunatics, or children. Even if we do not take their revelations into consideration, we are fortunate if they do not deceive us concerning the nature of the accident. When the introduction of the object has been caused by an accident, the diagnosis is easy. The impossibility of forming a diagnosis without a clinical history depends upon the fact that the symptoms produced are not characteristic. They also constitute the symptoms of numerous other diseases, among others of simple gastritis. Neither the character of the pain nor the observation of the vomited matters will serve as precise indications. This is not true, if we know their causes, because we can then employ them as a basis for conduct in our consideration of the facts and in the choice of treatment. Under this head it is proper to mention certain signs which may find an application in some special cases. Percussion of the epigastric region enables us to determine the position of the foreign body in the stomach in a small number of instances. Palpation will render better services in this respect as it enables us to explore the region more deeply. An indispensable condition for profitable palpation is the relaxation of the abdominal walls. We may also mention succussion, which gave good results in a case in which a game of dominos was swallowed by a lunatic (Foville). Finally, exploring instruments, such as the ordinary œsophageal sound, whether bulbous or with a resonator, are very useful ; they enable us to positively determine the presence of a foreign body in the stomach, and to a certain extent its relative position. If modified so as to permit the passage of an electrical current, they may also reveal the metallic nature of the foreign body. The application of a powerful magnet to the epigastrium has also been advocated for this pupose. These are ingenious measures, which must be cautiously employed, if we reflect upon the

serious accidents which repeated manipulations may produce, compared to their moderate usefulness.

Prognosis.—The prognosis is favorable in the large majority of cases. Of all portions of the digestive tract, the stomach arrests foreign bodies least frequently, and tolerates them better after they have been arrested. However, we now entertain correct ideas with regard to this benignity; we know that it does not correspond to the notions entertained by eaters of knives and other objects, and that the tolerance of the stomach disappears when the bodies are large and irregular. Size and shape are factors which cause the prognosis to vary infinitely. Nature, however, has exceptional resources, which diminish the mortality in these rare cases. Finally, we may state that the prognosis has diminished in gravity, thanks to the resources at the command of the surgeon; these resources vary from palliative measures to the operation of gastrostomy.

CHAPTER VI.

TREATMENT.

The treatment includes several methods, which have a different object, and which may be divided as follows:

1. Methods which have for their object the expulsion of the foreign body by the mouth.

2. Methods which have for their object its expulsion through the intestines.

3. The operative method, whose object it is to extract the foreign body by an incision into the walls of the stomach. Finally, we shall discuss the treatment of complications.

1. Methods which have for their Object the Expulsion of the Foreign Body through the Mouth.—In proposing this object, we desire to imitate nature, which makes use of vomiting, both as a symptom and as a treatment. This measure is readily realized, either by tickling the pharynx, or by administering an emetic in any manner whatsoever. We no longer employ, at the present time, the sound which Hunter and his contemporaries introduced into the stomach for the simple purpose of emptying it by producing contractions. But in some cases resort has been had to the most curious devices. Thus Hévin reports that a peasant, who had swallowed a knife, attempted to expel it by holding the head low, the body being turned upside down upon the edge of the bed. These efforts did not succeed. In another case, a mother, by violently spanking her child, succeeded in making it vomit, and thus removed two foreign bodies. But in point of fact, the indications for emetics are rare, and the counterindications numerous. It is necessary that the foreign body should be able to traverse the œsophagus readily, and especially to pass through the cardia, a condition which is realized with difficulty when one dimension of the body is larger than the other. In all cases the objects should be of small size. An extremely curious observation by Dr. Santos shows that nature may herself act on the patient in choosing what object she is able to expel.

Observation.—A Portugese officer had swallowed a number of foreign bodies, which remained for a long time in the stomach, and gave rise to various symptoms. The smallest ones were expelled by vomiting spells, and the longest ones with the fæces, according to the variations in their weight and size. The largest ones remained in the stomach. He thus expelled by vomiting ten bodies (pieces of wood and cane), and only seven by the stools. (Letter of Perrin to Labbé.)

We must, therefore, reserve emetics for special cases, in which the body is small, or in which we believe that it may give rise to secondary symptoms. This practice is wise in small children, because the dimensions of the other parts of the intestines, especially the natural constrictions, predispose them proportionately more to accidents. Thus we find that a cherry-pit which is lodged in the pylorus of a nursling will give rise to very serious symptoms.

Must we produce emesis in those persons who have swallowed needles, sharp fish-bones, etc.? Many think so, and are thus in accord with the popular belief. This practice often succeeds, but it is dangerous, as it does violence to the stomach, whose walls are contracted upon the foreign body, and may cause the latter to perforate them. Moreover, the almost complete innocuousness of pins, needles, etc., should reassure the surgeon and lead him to reject a dangerous, uncertain measure, and one which always aggravates the situation in case of failure. In fact, the stomach, being tired by its efforts and irritated, tears from the mere irregularities of the body, is no longer capable of digestion, does not tolerate food, and thus delays or entirely prevents the passage of the sharp body into the duodenum.

In conclusion, emetics constitute a valuable resource in some cases, especially in children, or when the foreign body may act both as a poison and an obstacle. They are contraindicated in all other cases, that is to say, in the large majority.

2. Methods which have for their Object the Expulsion through the Intestines.—Nature produces these fortunate results, in the large majority of cases, by spontaneously producing the passage into the duodenum, a result which the conduct of the physician should endeavor to further. We should, therefore, preferably resort to general measures and to careful precautions which will be suited to facilitate the action of nature. Hence the expectant plan is the rule in cases of foreign bodies in the stomach, and interference is restricted to a few exceptional cases in which nature is powerless.

The aim of all therapeutics is to aid the stomach in causing the pyloric orifice to open. In order to effect this, we must suppress all causes which, by producing accidents, will interfere with digestion. Four causes may oppose the passage, viz., the pain or irritation caused by the presence of the body, the vomiting which follows it, a spasmodic condition of the pylorus, and, finally, the irregular shape of the body.

The pain and the symptoms which it produces may be avoided or diminished by rest and a suitable position; the patients should be placed in bed and condemned to constant immobility, which should only be interrupted at long intervals. In what position should the patient be placed? In order to obey the indication referred to, and to suppress the pains as much as possible, we should allow the patients to choose their own position. But, if they are not suffering, and if the foreign body does not give rise to vomiting, it is preferable to place the body in right lateral decubitus. This position favors the descent of the foreign body toward the pyloric end of the stomach, accustoms this portion of the

viscus to an unusual contact, and permits the engagement of the object.

The irritation being relieved, the causes of emesis diminish, but are not always suppressed. In addition to the previous measures, we may employ all the sedatives and narcotics ordinarily used in such cases, such as ice, antispasmodics, laudanum, etc., which find useful indications in practice. Belladonna frictions, recommended by various authors, and especially by Balley, fulfil these indications very well. This surgeon advises large frictions upon the abdomen and epigastrium, with belladonna ointment; he also administers powdered belladonna internally, which, in addition to its narcotic, antispasmodic, and laxative action, possesses the property of relaxing the muscular fibres of the intestines, and especially the fibres of the pyloric orifice. Perhaps this opinion is slightly exaggerated, but the employment of this drug is none the less useful.

Alimentation should, especially in the beginning, be the object of the surgeon's care, because it may greatly contribute to the passage of the foreign body. If the reader remembers the remarks made above concerning the differences in the gravity of the symptoms according to the condition of fulness or emptiness of the stomach, he will readily understand the importance of surrounding the foreign body with alimentary matters. Hence the origin of a very old plan of treatment, which is so rational that it should be continued even now. It consists in the administration of gross, feculent substances, which facilitate the tolerance of the pylorus. The foods which best fulfil these indications are especially feculent articles (potatoes, rice, thick boiled cream), boiled white of egg, panada, given without drink. Some surgeons, and among others, Fabrice de Hilden, have obtained good results from the ingestion of fluid fatty substances, such as the oil of sweet almonds, fresh butter, fat, or somewhat thickened drinks, like very fatty bouillon, barley-water, etc., taken in large quantities.

By the side of these ordinary measures we may place another, which has been very rarely employed, but which has recently succeeded perfectly in Dickson's hands. He resorted to the administration of oakum in a case in which the swallowed body was irregular and dangerous to the mucous membrane and sphincters. This single fact is not sufficient to dispel the fear which I entertain with regard to the introduction of this fibre into the stomach and to its usually slight efficacy. The following is a history of this curious case:

Observation.—A lady swallowed a plate of false teeth during the night; extraction impossible; propulsion. The physician made her swallow a small amount of oakum and a large number of figs and raisins. This treatment was continued for a week, the pain being always situated at the pylorus. One morning the patient felt relieved, and a few hours later the foreign body passed through the anus. The oakum and bits of the figs were attached to the irregularities of the false teeth, and had rendered the surface somewhat smoother. (Edinburgh Med. Jour., p. 839, 1876.)

The employment of all these measures is usually crowned with success, and the body passes into the intestines. Must we continue them for several days, if they fail at first? Although there are no great chances of success, we may continue them without inconvenience, the nourishment being changed in such a manner as to avoid emaciation, which is so disastrous in such cases.

Finally, whether the body has passed out or is still in the stomach, we will obtain good effects in some cases from the administration of laxatives and sedatives.

It is unnecessary to recall all the empirical remedies referred to in the old therapeutics of foreign bodies in the stomach. They no longer deserve a place in modern works, and merely possess an historical interest, such as the ingestion of a magnet when pins and needles are swallowed.

On the contrary, the idea of dissolving soluble foreign bodies has existed for centuries, with only slight modifications, and is capable of producing good results in some cases of small and pointed metallic objects, the shape of which permits fragmentation. The ancients had recognized this plan of treatment, and would have made it an ordinary measure if they had not been restrained by the prejudices of their contemporaries concerning the danger from the soluble metallic products.

The examples which Hévin reports are protestations against this fear, rather than practical encouragement. He nevertheless recognized the fact that we may use solvents, but only under the condition of promptly ridding the organism of these products, by the use of oily lenitives and the ingestion of milk. Fortunately these fears of the ancients with regard to solvents are groundless, and the palliatives which Hévin recommends have no practical use, since, in order to protect and lubricate the parts, these unctuous substances should be administered before the medicine. They diminish the action of the latter upon the foreign body, which becomes covered with them; but we cannot formulate an absolute rule with regard to all metals. Thus it would be easy to find a substance which would react upon objects made of iron, and the products of which would not be dangerous to the economy. The mineral acids produce combinations with this metal which physicians employ successfully every day in the treatment of affections of the blood. We therefore resort, in these cases, to citric and tartaric lemonades, given in sufficiently large quantity, and in the requisite degree of concentration. It is well to add a solid, inert food,the imbibition and digestion of which will favor its action upon the metal. Such articles include biscuits, etc., and especially bread. These agents undoubtedly possess but a slight activity, but they are preferable to the employment of hydrochloric acid, which has a very slow action upon iron, and of the other acids whose salts are less harmless.

The iron itself is sometimes refractory. Bishop (Lancet, 1874) reports that, in a case in which a piece of horse-shoe had been swallowed, he resorted to the use of laxatives and a mixture of nitro-muriatic acid, given three times daily. The galvanic needle was also employed, but without success. The foreign body was passed by the bowels more than two months later.

Do copper or leaden foreign bodies act in the same manner? Is it dangerous to attempt to dissolve them? Despite a few extraordinary cases reported by the older authors, we do not find a single positive example in man in which a copper or leaden body was sufficiently dissolved to enable us to state that a real advantage was derived from the use of solvents.

Observation.—Becquerel reported to the Academy of Sciences, in 1846, that a dog had swallowed, twelve years previously, a five-franc piece and a penny. At the autopsy the silver coin was found to weigh twenty-three and four-one-hundred-and-twenty-fifths grammes instead of twenty-five. The penny, on the contrary, was very markedly changed; it had become very thin, and was covered with a blackish substance, which was supposed to be the sulphate of copper, more probably the sulphide. It only weighed five and a half grammes instead of twenty.

Observation.—Wedelius, quoted by Hévin, reports a case in which a woman swallowed a very large copper coin by mistake. She suffered from pain and feeling of

weight in the stomach, which was felt when the organ was empty, especially in the morning; in addition, she continually had an annoying taste of copper in the mouth. Wedelius ordered her to eat fat, greasy food. He also administered from six to eight drops of spirits of ammonia, twice a day; this remedy gradually diminished the coppery taste in the mouth, as well as the pains of which the patient complained.

Unfortunately no mention is made in this case of a very important factor, viz., time, and details concerning the result are wanting.

The same author also adduces a very doubtful example of solution in support of his views:

Observation.—A child swallowed a lead seal; his relatives, uneasy concerning the possibility of lead poisoning, consulted a surgeon, who administered distilled vinegar. The seal was never found in the stools, and the author therefore gratuitously supposes that it was dissolved.

There are more than twenty examples on record of foreign bodies of which no traces have ever been found, and in which solvents have not been used, so that such cases prove nothing.

En résumé, there is no advantage in giving solvents for lead and copper unless the bodies are sharp or capable of being broken. Needles, brass pins, a hollow brass pen-holder, an irregular piece of lead, may fulfill these conditions. We then administer vinegar for lead and copper, and mercury in those cases in which the body forms an alloy of slight consistency. Every one knows the energetic action of this substance upon copper, gold, and silver. Its alloys are nowhere more dangerous than in the digestive canal, and I would advise its administration in small doses when the foreign body is small and thin.

The Extraction of Foreign Bodies from the Stomach. The Operation of Gastrostomy or Incision of the Stomach.—Is the extraction of foreign bodies from the stomach through the mouth beyond the resources of art? We are forced to answer this question in the negative at the present time, but it will undoubtedly become more possible at some future period. We can in thought conceive of an instrument which will enable us to act with as great facility upon the stomach as upon the bladder, in order to grasp and extract foreign bodies. Such measures will undoubtedly demand great skill on the part of the surgeon, and will only find an application in exceptional cases.

The operation of gastrostomy is hardly accepted by all surgeons, and the small number of cases which the literature contains testify to the scant sympathy it has met with for centuries, and to the rarity of its indications.

Gastrostomy is, nevertheless, a very old measure, since it is found in the writings of authors who lived before the reign of Louis XIV. One of the cases quoted by Hévin bears the date of 1636; that of Crollius occurred in 1602; but since that period, despite the thousands of cases of foreign bodies which have been accumulated, there are not more than twenty cases of gastrostomy. It is more than probable that all of them are not known, and it is curious to find this plan so little employed, even in extreme cases, by the bold surgeons who have lived in every age.

The present century alone furnishes almost a half of the number of operations of gastrostomy, almost all of which terminated successfully. These really serve as a basis for writing upon this subject, because the observations of the last century are very obscure and incomplete. Among these successes we must mention those obtained by Cayroche de Mende, by an anonymous surgeon, and by Bell and Labbé, for the extraction of knives, bars of lead, and a fork.

Description of the Operative Procedure.—The operation of gastrostomy is performed under very different circumstances; either a tumor exists in the left hypochondrium, formed by the projection of the foreign body, or the latter does not project, and the region is found in a normal condition. It is evident that the presence of a projection at any point creates for the surgeon a place of election at which he should incise the integuments. The method which we shall describe has not been employed by all surgeons who have performed gastrostomy; the differences consist, especially, in the incisions of the skin and in the manner of making the incision of the stomach. The plan recommended by Labbé, in a communication to the Academy of Sciences, is generally adopted. As for the rest, the indications to be followed and the dangers to be avoided, are not new, since Hévin had already made very judicious remarks upon the subject. We must recollect that the stomach is not an immovable organ, that its repletion carries the greater curvature forward, and that its empty condition shortens it considerably. The best condition under which to avoid the vessels would be to operate upon the stomach when half-filled, because it will then project of itself after the walls are incised, and we will avoid section of the vessels, a very serious matter in the present case. Finally, the patient should always be anæsthetized.

Labbé's method.—It is based upon this anatomical fact, viz., that the greater curvature will not extend in the cadaver, beyond a transverse line uniting the lower ends of the cartilages of the ninth ribs. This is the maximum limit, as expiration does not produce such a great depression during life.

In order to recognize the base of the cartilages of the ninth ribs precisely, we run upward along the border of the false ribs with the tip of the index finger; we thus ascend to the first depression, below which the cartilage is found.

Operation.—Labbé advises "that 0.01 m. within the left false ribs, and parallel to the latter, an incision be made four centimetres in length, the lower end of which should fall upon a transverse line passing through the cartilages of both ninth ribs. By operating in this manner, we reach the anterior surface of the stomach at the union of the cardiac and pyloric portions."

We must cut carefully layer by layer.

2d period: The stomach is seized with a mouse-toothed forceps, and is withdrawn and left to an assistant. The surgeon then passes threads through the stomach with a hollow needle, in such a manner as to attach it to the external wound, support being given to the serous membrane.

3d period: The stomach is opened between the sutures, and the foreign body is extracted with forceps or a tenaculum, care being taken to disengage the points, if there are any, as on more than one occasion they have been found imbedded in the walls and surrounded by fungous growths.

However, if we review some of the plans which have been followed by operators or advised in the books, we will soon find that they are not made exactly like the preceding. Vidal de Cassis proposes an incision nine centimetres in length along the linea alba in the epigastric region. This incision is bad, because it will inevitably bring the surgeon in contact with the transverse colon; moreover, Vidal recognized this fact himself, since he advises that the colon be pushed downward. Even before Labbé, Neal and Bell had employed other methods in the living subject. Their incision was four inches long, and extended from the umbilicus to the left false ribs; the peritoneum was also cut. They then plunged the hand into the cavity, seized the stomach, and incised it. These American

surgeons did not sew the stomach to the wound. They left the stomach to itself, believing that the contraction of the muscular coat would entirely close up the opening. Bar[1] advised the use of a hooked troca, which enabled him to withdraw the stomach by applying it to its walls, and he endeavored to imitate nature, which produces union of the serous membranes anteriorly. Labbé first employed Récamier's method before cutting, but he was unsuccessful. Adelman deprecates the use of narcotics, and did not apply a ligature to the stomach. The external wound was united by points of suture and adhesive plaster. These authors obtained successful results in two cases by this primitive method of operation. These facts are useful, because they demonstrate that gastrostomy is not such a terrible operation as we generally believe; but, in future, the plan which succeeded in Labbé's hands will be preferable, as it is more rational and less dangerous.

The surgeon, after having sewed the stomach to the wound, should determine the regimen of the patient, a very important matter, upon which the success of the operation often depends. Absolute rest is indispensable, and we must therefore adopt the preliminary precaution of emptying the bladder and rectum. The region itself should be rendered immovable as far as possible; large strips of diachylon at the base of the thorax, and a collodionated cuirass, applied in all cases, may moderate and especially prevent peritoneal symptoms. The opinions of surgeons differ as regards alimentation. In Bell's and Neal's cases, the edges of the stomach not being united, the diet was absolute, in order to avoid an otherwise inevitable peritonitis. We should also administer opium to the patients, and leave them without food for several days.

Those who perform true gastrostomy with sutures regard the diet as less indispensable, and are not afraid to let the patients swallow jellies or some light, nourishing food, like the yolk of egg. The introduction of food may be made directly through the wound without any inconvenience. The general reaction is very moderate, and the suppression of the pains and other symptoms procures for the patients a salutary rest.

As soon as the wound granulates or is slightly united, we must feed the patient, because the marasmus from which he was suffering at the time of the accident may prove a cause of failure. The fistulæ do not last very long, as we may see from the histories of the cases, and the recovery is complete in the majority of instances.

A few cases will better explain the preceding remarks:

1. and 2. *Crollius* performed gastrostomy or incision of the stomach, in 1602, for a knife, and *Guenther*, in 1613, for a pen-knife.

3. *Shoval*, like the preceding surgeons, also succeeded, in 1635, in extracting a knife, six and a half inches long, which had been retained for six weeks. Recovery in fourteen days. (Chelius' Surgery, Vol. II., p. 391.)

4. *Daniel Schwaben's operation* (1635, Koenigsberg), performed for the purpose of extracting a knife, ten inches long, from the stomach, a month and a half after the accident. The patient was placed upon a board; longitudinal incision in the left hypochondrium. The stomach withdrawn with the aid of a curved needle; incision upon the point of the projecting knife. The stomach was left to itself; suture of external wound. Balsamic drinks. Recovery in a very short time. (Hévin: Mém. de l'Ac. de chirurgie.)

5. *Operation by F. Mathis*, of Prague.—Knife nine inches long. Prompt recovery.

6. *Operation by Hubner, of Rastembourg* (1720).—An open knife swallowed by a woman, who afterward felt such a severe pain that she demanded the operation. After the incision, it was found that the knife had already penetrated the stomach

[1] Thèse de Strasbourg, 1865.

and had given rise to a slight suppuration in the wound of this viscera. Prompt recovery.

7. *Operation by M. L...., Surgeon-Major at Nîmes.*—A soldier swallowed a small silver spoon, which he had stolen, in order to evade a search. Diffuse tumor in the left hypochondrium. Impossibility of going through the exercises, riding among others. After a forage, the tumor became more marked. A puncture with the point of a bistoury struck a hard, resonant object. The incision was enlarged, and permitted the extraction of the spoon. Adhesion of the edges of the wound in the stomach to that in the integuments. The recovery occurred promptly.

8. *Operation by M. Cayroches, of Mende*, 1819, performed upon a young woman, æt. twenty-four years, who had swallowed a fork while attempting to produce emesis. This body remained in the stomach for three months without any other symptom than a feeling of weight. Toward the fifth month, violent vomiting after an attack of indigestion. Movements of the fork. The points were situated in the right hypochondrium near the vertebral column, the handle two fingers' breadth above the umbilicus on the left side. Severe pains, emaciation despite the preservation of appetite. In the sixteenth month, a tumor in the epigastrium as large as a hen's egg, pressure upon which caused the fork to undergo very painful movements. The operation was made at the request of the patient. Vertical incision, two inches in length, over the tumor. Peritoneal adhesions. Incision of the stomach upon the fork. The prongs, which had become imbedded, had to be dissected out, the fork was blackish. Complete recovery in eight days; very good health from that time, since when she has had several children.

9. *Operation by Tilanus.*—"A woman, æt. 32 years, suffering from religious mania with a tendency to suicide, swallowed a silver fork. Prof. Tilanus advised gastrostomy, which was performed three days later. The patient died at the end of the second day." (Didericus Henr.: Diss. medico-chirurgica, 1848.)

10. *Operation by B. Neal* for a bar of lead swallowed by a man on a wager; weight one pound. No symptoms for three days. Then severe pains; colic. Tongue white; fœtid breath; constipation. Laxatives and morphine caused relief. Reappearance of symptoms of gastritis on tenth day. Gastrostomy after anæsthesia. Marked relief, opium treatment and diet for three days. Complete recovery.

11. *Operation by B. Bell* (Gaz. hebd., 1860), performed on a man who had swallowed a bar of lead while playing tricks. Emesis, gastralgia, prostration. Operation nine days later. Recovery at the end of ten days, without accident. The bar was 0.30 m. long and weighed 270 grammes.

12. *Labbé's operation, Paris*, 1874.—A young man, in a spirit of braggadocio, swallowed a fork, which produced œsophageal symptoms, and then fell into the stomach. Complete absence of symptoms for six days. He could even resume his occupation. Nineteen days later he began to suffer from very severe pain in the rib, which impeded respiration. Impossibility of performing any movement. The pain was situated in the left hypochondrium; face pale, distorted, pulse small. This paroxysm lasted three hours, after which he felt better. At the end of a month and a half, formation of a tumor on the left side below the false ribs, with a certain amount of redness of the skin. The prongs of the fork could be recognized in this situation. Blister over the tumor, which disappeared. These symptoms were reproduced at very short intervals. Alternations of comfort with moderate suffering. Nevertheless the symptoms finally assumed a greater intensity. The general health was profoundly affected. The fork could be felt when the stomach was distended with food. Labbé, after having consulted with MM. Gosselin and Larrey, decided upon surgical interference. Numerous applications of Vienna and Canquoin paste, in the hope of producing adhesions from without inward, produced no result. He was compelled to substitute the action of the bistoury for that of the caustics. Operation by Labbé's method after anæsthesia. Eight points of suture. Threatened peritoneal symptoms removed by collodionated cuirass, compression and champagne *frappé*. Recovery almost complete. Very narrow fistula.

13. *Cayzergues* saw a young man operated on for a fork.

14. In 1856, *Gluck*, in America, made an incision into the stomach in order to extract a catheter which, having been used to make an injection into the trachea, had passed into the stomach. Death.

15. *Bouchet, of Lyons*, successfully extracted a fork. (Colin: De la taille stomacale. Thèse, Paris, 1877.)

THE INDICATIONS FOR GASTROSTOMY.—The indications for this opertion depend upon the patient and the foreign body: upon the patient,

according to his condition and the manner in which his stomach tolerates the arrested foreign body; upon the foreign body, when its shape and other properties render it certain that it will not pass into the duodenum. Is there a well-defined boundary between those cases in which we must operate and those in which interference is counterindicated? We do not think so, and the rules which decide the opinion of the surgeon depend upon circumstances. We hasten to state that all other methods of treatment should have been previously employed.

With regard to the symptoms produced, the operation may be made either primarily or secondarily. It is primary when made in the first fortnight following the accident, when it is undertaken in order to relieve acute symptoms of gastritis, which would inevitably lead to a fatal termination. These unfortunates, worn out by their intolerable pains, dejected, prostrated by incessant vomiting and enfeebled by almost complete inanition, imperiously demand surgical interference. Not only are they impelled by their sufferings and their continually increasing alarm, but they also have little dread of an operation whose dangers they are far from suspecting. Such are the reasons for which the operation is performed primarily. They reappear as secondary indications, when, after a variable period of indolence, the body suddenly becomes injurious to health, when its presence makes itself felt and gives rise to serious symptoms. At this time the chances of expulsion are very small, while the general symptoms become more threatening from day to day. Emaciation and marasmus very soon follow the gastro-enteritis, and demand interference.

Finally, the nature of the body and its situation furnish important considerations, which may, to a certain extent, influence the surgeon and induce him to operate. These conditions are entirely physical and require a knowledge of the history of the case.

One of the most important among them is the position assumed by the foreign body in the stomach. If an open knife or a fork is placed along the axis of the stomach, it will be quite harmless and will not require an immediate operation. Every conscientious surgeon would refuse to operate if the body has not produced serious symptoms. We should not weigh the gravity of the present and future symptoms in the same balance with the dangers to which the operation will expose the patients, as we must disregard figures and not regard interference as harmless because there were only two cases of death in fifteen operations. But if, in the meanwhile, the position changes after an effort at vomiting (as has been observed), if a knife leaves the axis of its line of relative harmlessness, if a fork distends the anterior and posterior surfaces of the organ, the indications change and the situation becomes clearly defined. Or perhaps the foreign body reassumes its previous position (as happened in Labbé's case) and the tumor formed by the projection of the foreign body disappears; or the pressure continuing, the extremities of the body will tend to penetrate into the side of the abdominal walls or into the peritoneum and deeper viscera. The first occurrence is the rarest, and the choice rests between two terminations, abscess and external tumor, on the one hand, and almost inevitably fatal peritonitis on the other. Hence the surgeon does not hesitate to consider the operation indicated if there is a tumor and external projection. But what time should be allowed to elapse between the appearance of the tumor and the time of operation? The question is determined by the time necessary for the formation of the necessary peritoneal adhesions. We must except those cases in which

the intensity of the symptoms, and the threatened peritonitis in consequence of the extreme pressure, indicate that the operation should be performed as speedily as possible.

The same reasoning may be applied to the other properties of the foreign body. Thus we cannot regard a sharp, open knife, or a fork with four sharp prongs, in the same light as a coin or a regular piece of wood. Are we justified, in such cases, in hoping that nature will be so obliging as to renew one of the strange exceptions reported in literature? Evidently not, and the surgeon is wise who interferes at the appearance of the first symptoms. Almost all cases of death from foreign bodies are due to perforations. It is therefore better to prevent them and to substitute a well-regulated and simple operation, the results of which are encouraging, for the hazards of a problematical chance.

En résumé:

1. The operation of gastrostomy is indicated whenever the intensity of the primary or secondary symptoms produced by the arrest of the foreign body threatens the health of the patient. It may be either primary or secondary.

2. The operation is also indicated when the foreign body projects externally, and immediately, if the foreign body is dangerous from its shape, or if the symptoms are very grave; a little later, if the preceding conditions are absent, so as to permit the formation of peritoneal adhesions.

Treatment of Complications.—The most serious complication is the inflammation which the body produces, and which may invade the neighboring organs, especially the peritoneum. If peritonitis develops, it should be treated as in traumatic cases, either with applications of belladonna ointment, together with a certain amount of compression, or by the immobility and compression which is so readily obtained by the employment of collodion. Large cataplasms and iced drinks are useful. If pus has formed in an abscess in the wall, we must open it with a bistoury, evacuate the pus, secure drainage, and explore the cavity carefully and cautiously. The best explorer is the finger, although its introduction is sometimes inconvenient. In some cases we may substitute for it a female catheter, a grooved stylet or sound, which give the sensation of the foreign body. If the abscess is empty and the opening has become fistulous, the suspicions of the surgeon should be aroused when the fistula is situated near the umbilicus and especially in the right hypochondrium. He must examine it carefully, and must consider the causes of the fistula. What should be done if the foreign body is recognized at the bottom of the fistula? Extraction is evidently the most natural plan. If the body is large and cannot be withdrawn, should we make an incision or not? We should not resort to this measure unless progressive dilatation with laminaria and prepared sponge fails; and even then it would be more prudent to enlarge the opening with the aid of caustics applied to the fungous growths. All these precautions tend to the same end, viz., to avoid incisions which involve tissues in a state of chronic inflammation and which would tolerate a fresh injury but poorly. This is a general rule, which finds application in abdominal fistulæ more than in others.

FOREIGN BODIES OF THE INTESTINES.

CHAPTER I.

CLASSIFICATION.—ETIOLOGY.

Foreign bodies of the intestines have either been ingested, or they have been formed entirely within the viscera. The origin of the first is known, so that it only remains to follow their evolution in this portion of the digestive organs, to determine the causes of their arrest and the conditions which favor them.

We must regard the duodenum, on the one side, and the sigmoid flexure, on the other, as the boundaries of the intestines. They do not measure less than six metres between these two extreme points, and this distance must be traversed by those foreign bodies which have passed through the pylorus and those which have formed at the expense of alimentary masses or of some calculus.

Despite its length, the intestines are very little predisposed to the arrest of foreign bodies; we may even say that its functional tolerance is greater than that of other portions of the digestive tract. Many bodies of a moderate size are not more perceptible to us than alimentary articles, but these favorable conditions disappear when they reach the lower part of the ileum and ileocæcal valve. Up to this point the calibre of the intestines is sensibly equal, very large, very often dilated, and rarely the site of active spasmodic contractions, such as occur in the œsophagus and stomach. Peristaltic contractions are often observed, but this slow, vermicular movement is very favorable for the progression of foreign bodies, because it acts without suddenness upon a body which is lubricated by the secreted products. If the body is arrested in its course, the contraction does not become tonic as in the œsophagus, and its irregularities have therefore less tendency to perforate the walls, which yield a little on account of their elasticity. There are exceptions to this rule, but it nevertheless holds very generally.

Anatomical Conditions which predispose to the Arrest of Foreign Bodies in the Intestines.—The second portion of the intestines, on the contrary, is more favorable to the arrest of foreign bodies, and the anatomical conditions afford a sufficient explanation of this predisposition; on the one hand, a very narrow valvular orifice situated at a right angle at some distance from the extremity of the cæcum; on the other hand, the vermiform appendix, capable of retaining foreign bodies or fæcal matter. Are these reasons not sufficient to explain the predilection of foreign bodies to arrest in this locality? We must also add to these peculiarities, the influence of the angular insertion of two portions of the

intestines into one another, and we readily understand why this locality should be one of the places of election.

The influence of the vermiform appendix is not equal at all periods of life, because, according to German researches, the organ does not always present the same anatomical disposition. Thus, C. Paul has observed that in children the chances of arrest of foreign bodies in the cæcum are less than in adults, because the appendix is provided at its orifice with a valve which completely occludes it; this valve exists much less frequently in adults, than in childhood and adolescence. However this may be, the presence of the cæcum is one of the most powerful predisposing causes, and exceeds almost all the others. In fact, the constriction of the calibre of the intestine at this point is singularly disposed to favor the penetration and arrest of indigestible alimentary matters like seeds, fruit-stones, etc.

Finally, without departing from the normal arrangement, we also find vacuoles in the large intestine, formed by longitudinal and transverse fibrous bands which enclose spaces to which we have applied the term cellulosities.

Influence of Pathological Conditions in the Intestines.—If, however, we examine the influence of pathological conditions upon the arrest of foreign bodies in the intestines, we will soon find that it is considerable. Some are external to the healthy intestine, others depend upon some peculiar alteration or anomaly in the canal. The first are undoubtedly very frequent, as we may include in this group of predisposing conditions all the tumors or deformities capable of modifying the calibre of one or several parts of the intestines. There are very few abdominal affections, or diseases of the digestive tract or its annexes, which do not sooner or later produce some modification in the normal anatomy of the intestines. At one time, retractile fibrous adhesions unite two portions of the intestines; at another time, neoplastic or inflammatory tumors compress a loop of the intestines. There is hardly any necessity of mentioning all the causes which act mechanically, but the real influences of which merit the attention of surgeons.

Among these tumors there are some which are observed every day, and which sometimes, despite the ingenious measures to which nature resorts, produce arrest of stercoraceous matters in a portion of the intestine. I wish to refer to the development of the ovum in the uterus, which predisposes, to a certain extent, as the facts prove, to the arrest of foreign bodies.

In a word, all causes of mechanical obstruction may predispose to the arrest or formation of foreign bodies in the intestine. But without going out of the organ itself, it often happens that a change in its walls, a congenital or acquired anomaly, plays the principal part. For example, all internal changes, cancerous, syphilitic, dysenteric, tuberculous, etc., ulcerations which are observed in the intestines, give rise, if they are extensive, to a constriction, a diminution in the calibre of the canal, and thickening, by infiltration, of the adjacent walls. In some cases even death may result from a perforation by some old foreign body, or one of new formation, arrested at this point.

We must place the diverticula, which are abnormally observed upon the intestines and especially upon the small intestine, in the same category. They form pockets of variable dimensions, from a few centimetres to several inches, which resemble herniæ of a portion of the intestines, and the inconveniences of which are evident *à priori*. They really form small

blind culs-de-sac, analogous to the vermiform appendix, and which are very well adapted to retain foreign bodies or to give rise to them.

Influence of herniæ.—But such anomalies are not very common, and we rarely have occasion to observe their evil effects. This is not true of the influence of herniæ, which have, from all time, attracted the attention of surgeons under very striking circumstances. What occurs in a hernia? There is at first flexion of a loop of the intestine at an acute angle, and constriction of the intestines at the neck of the sac. These two very disastrous conditions explain the relative frequency of arrest of foreign bodies in the herniæ. At other times, an old hernia, which has been reducible for a long time, is incarcerated at a given moment; after appropriate treatment it may be reduced, but only *en masse*, so that the acute elbow persists in the abdomen, and favors both the arrest of foreign bodies and the stasis of alimentary matters.

Predisposing Causes of Functional Origin.—In addition to these mechanical conditions, there are others which have perhaps a less action upon the arrest of bodies coming from the stomach, but which play the chief part in the production of concretions and enteroliths. These very functions of the organ have a powerful action by gradually producing thickening of the digested substances. At the period at which they pass from the stomach into the duodenum, they are very fluid and jelly-like; this is proven daily by acts of vomiting. They are much thicker, on the contrary, after intestinal absorption—which is very active in the lower portions of the intestinal canal—has extracted the nutritive juices. This is such a powerful cause, that it has more effect than all the others combined. But it is subject to very great individual and pathological variations, depending upon an infinite number of conditions, such as temperament, age, climate, and, in addition, the character of the food. We can readily comprehend that the predisposition to concretions or foreign bodies will vary greatly according to the nature and quantity of the food. In certain cases the affection may become endemic, in others even epidemic. Some details are necessary in order to clear up this comparatively unknown portion of the pathogeny of intestinal concretions. The principle is always the same: the greater the proportion of undigested matters in the food, the greater will be the predisposition to intestinal concretions. It is a commonly observed fact that there is a difference in the quantity of fæcal matter voided by the poor man who eats a great deal of bread, and the rich one whose nourishment is chiefly nitrogenous. They are also unequally exposed to the production of concretions, and if, after the ordinary diet of country people, the quantity of fæces increases, we will also find an increase in the number of cases of concretions. Thus it has long been noticed that the inhabitants of Ireland, Scotland, and England, who live upon oatmeal, were especially subject to this class of affections.

The presence of bristles, barley-corn, and especially grains of oatmeal in these single or multiple foreign bodies, sufficiently indicate their origin, and they have been looked upon in this light by Children, Monro, Cloquet, Turner, etc. At the present time, thanks to the advance of civilization, these cases are much rarer, but they are interesting from an etiological point of view. Human bezoards, a few examples of which have been observed, are formed around foreign bodies, which are difficult of digestion and are somewhat similar to the preceding.

As a rule, they are caused by the ingestion of masticated fibres of licorice-root, cocoa-bark, twine, etc. The literature presents several curious examples (Laugier). Next to alimentation, we must mention all the

changes in the innervation of the intestines or in the secretion of the glands in the intestinal tract. In fact, we know that intestinal paralysis often gives rise to constipation, and that certain poorly understood disorders of intestinal innervation, which are dependent both upon the systems of organic and animal life, give rise to changes in the glandular secretions, the effect of which is the production of concretions. Hence, old men, who are often constipated, are more predisposed to stercoraceous tumors.

It is impossible to determine precisely what part of the action is due to motor paralysis, and what to the disturbance of glandular innervation. Their influence is undoubtedly connected; but the tympanites is perhaps due more to altered secretion than to paralysis. Experiments are necessary to determine the nature of the disorders which give rise to the formation of concretions and the exaggerated tendency of the glandular organs to produce incrusting salts.

It is evident, from the above remarks, that these causes act in a synergic manner, and not to the exclusion of one another. Hence we can comprehend the peculiar importance of the cæcal portion of the intestine in this respect, since it predisposes to the arrest of foreign bodies by its anatomical peculiarities, and to the formation of concretions by its situation, by the diverticula which are found in it, etc. It is in this way that we must regard the etiological rôle of the causes which we have briefly enumerated.

CHAPTER II.

NATURE OF INTESTINAL FOREIGN BODIES.

It is useless to repeat the previous statements concerning the nature of the foreign bodies introduced into the mouth, and which pass through the intestinal tract. The large majority pass into the intestines, but some of them are arrested on account of the predominance of one of their dimensions. But I must insist upon the nature of the various concretions which are frequently observed, and which always originate from the food or the products of secretion.

Influence of small objects, which are indigestible.—If we investigate the thousands of cases of foreign bodies and stercoraceous tumors in the intestines, we are struck by the disastrous influence of bodies which are very inoffensive in themselves, and which have no other fault beyond that of being indigestible. These include grains, fruit-seeds, grape-seeds, fruit-kernels, etc. These bodies, which usually have no injurious effects, may become real foreign bodies in some cases, especially if they accumulate in considerable numbers. Size plays an unimportant part in this respect, and we may even state that those of moderate dimensions are more harmless than the others. They are, in fact, unable, like kernels and seeds, to enter the diverticula and the vermiform appendix. On the other hand, slightly increased dimensions are much more favorable for physiological migration than those of oblong bodies.

The number of the foreign bodies.—These preliminaries were indis-

pensable in order to understand the development and composition of certain bodies in the intestines, and, among others, of enteroliths. They are sometimes single, sometimes multiple. Cruveilhier reports a case in which upward of six hundred and ten cherry-pits were found in the intestine; examples of numerous pits of the same fruit abound in literature, and in another case thirteen hundred were found. Other fruits, such as prunes, dates, plums, are also represented. The Gazette médicale for 1835 contains a case reported by Dor, of an unfortunate who had swallowed eight hundred plum-pits and eighty-two shot.

I quote these cases from among a thousand others. The foreign bodies are usually collected together, and bound to one another by other substances, equally indigestible, but amorphous, which enclose them, and sometimes transform them into true conglomerates or concretions.

Multiple concretions without a defined foreign body.—Even in the absence of organized foreign bodies, such as pits or seeds, the intestinal substances themselves may, under the influences referred to, become hard and give rise to concretions, the number of which is very variable, but which may become very great, since certain authors have observed as many as thirty in the same person. Whatever their origin may be, if the foreign bodies are multiple, they often approach one another, and may then, in consequence of the mutual contact, and under the influence of peristaltic movements, assume different shapes, be united into bands formed of alimentary fibres, or even provided with conchoid facets, like cholesterine calculi in the bladder.

Next to the number of these foreign bodies, we must consider the shape, which is not unimportant to the surgeon; when the concretion is single, and does not contain an organized nucleus, it is usually very irregular. In the latter event, on the contrary, the tumor assumes a well-defined geometrical shape, because, as we shall soon see, the foreign body may become the centre of a true calculus. The majority are ovoid and elongated, and this shape is due to the form of the containing organ, which is usually the cæcum. The concretions presented to the Anatomical Society by Durand Fardel, and which were expelled by a lady forty years of age, were fifteen in number; they resembled dried almonds or pumpkin-seeds, were very hard, and contained in the centre a very small kernel, which looked exactly like a fruit-seed; the centre contained vegetable tissue.[1] Huess and Mosander have described an enterolith which measured 0.17 m. in length, and 0.06 m. at the thickest part; it filled the cæcum and penetrated the vermiform appendix.

The preceding remarks sufficiently show the great variations in the weight and volume of enteroliths, as we find them ranging from the size of a raisin-seed to that of an adult head. I shall also show that the foreign bodies frequently undergo a very peculiar incrustation, which modifies their volume and characteristics. A poorly defined, irregular process occurs around certain foreign bodies, which results in their enclosure in a shell, which is sometimes distinctly saline, and sometimes half organic and half calcareous. Organized bodies, like kernels, are more especially predisposed to this formation, but they do not manifest this peculiarity alone, since a tumor of this kind has been known to develop around a quarter of an orange which had been swallowed six months previously without being masticated. I will reprint, from Albers, of Bonn, who has written a

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[1] Bull. de la Soc. anat., 1864, p. 85.

great deal upon the subject of typhlolithiasis, a typical case of this variety of nucleated calculi.

Observation.—Mrs. L., aet. 23 years, began to suffer on Monday from pain in the stomach; bowels regular. Eight grains of white oxide of zinc and a blister were ordered, after which the pains ceased almost entirely; the patient only complained of profuse perspiration. On Wednesday evening an emulsion of castor oil and wild cherry was given, which produced six liquid stools. No new symptoms; a condition of weakness, without suffering, until Friday evening, when repeated attacks of vomiting suddenly occurred. The patient vomited a clear, acid fluid; violent pains, umbilical colic, constipation. On Saturday the entire abdomen was very sensitive to the slightest pressure; bleeding, leeches, which produced slight relief. No passages, despite the administration of castor-oil enemata. On Sunday and Monday, continuation of the pain, with exacerbations and remissions; purgatives, and more active enemata were ineffectual. On Tuesday the pains became intolerable, the eructations had a bad odor, and the patient vomited a foul liquid mass. In the evening the pains suddenly ceased, the abdomen became tympanitic, but the tympanites remained stationary until Wednesday morning, when it suddenly increased without any apparent cause. The patient died at mid-day.

Autopsy.—The stomach and liver were in a normal condition; the small intestine was considerably distended by foul gases, and contained a yellowish fluid. A hard tumor was found at the ileo-cæcal valve. This mass, as large as a walnut, was whitish, composed of two layers, and here and there contained pieces of a fruit kernel. Its lightness and friability left no doubt as to its calcareous nature. Small, blackish masses, formed of hardened excrement, were found between the two layers. The calculus had produced a depression and sacculated dilatation at the point at which it was lodged. It was evidently produced by a secretion from the mucous membrane. (Arch. für physiol. Heilk., 1851.)

These concretions are rarely situated in the small intestine, but much more frequently in the large intestine.

The most striking characteristic of intestinal calculi in man is their arrangement in concentric layers, alternating with various colored strata of fæcal matter. The chemical composition is almost always the same; they are composed of carbonate and phosphate of lime, and sometimes also of the ammonio-magnesia phosphate. It is difficult to explain the genesis of these calculi. To say that they are caused by a change in the secretions is merely begging the question without solving it, for it is very difficult to understand why these bodies are almost invariably composed of certain salts which the digestive canal, when in a normal condition, contains in extremely small quantities. And how shall we explain the intermissions which occur in the deposit, and which are evidenced by the presence of concentric layers with alternating colors? These phenomena are still very obscure and remain undecided.

The process of deposition may also occur upon amorphous bodies, upon thickened indigestible substances, and the calculi will then have a fæcal nucleus in the centre. Sanchez de Toca[1] reported the case of an enormous calculus weighing 600 grammes, and with a transverse diameter of 0.08 m., which was formed of phosphate and carbonate of lime, and had hardened fæcal matters in the centre. But matters do not always proceed so uniformly, and the regular stratification of the various layers is not always present. Thus, in concretions formed by cherry-pits, the substances surrounding the pits are composed, in great part, of the same salts as those in the calculi, which are simply agglomerated and mingled with other foreign bodies. These enteroliths also assume a deep brown color. In Aberl's case, after the expulsion of a large calculus, thirty-two

[1] El Siglo Medico, 1862.

small ones escaped; taken together, these calculi weighed 1.250 kilog. A cherry-pit was found in the centre of each calculus. The cortical portion was formed of concentric layers of crystalline substances of a brownish color. No biliary coloring matters were found in the calculi; they contained phosphates and sulphates of lime and magnesia.

Finally, we can very readily understand that a biliary calculus may be changed into an intestinal concretion, by becoming encrusted with calcareous salts. These cases are very rare, but are sometimes observed (Vulpian). We then find the biliary calculus intact in the centre of the concretion.

CHAPTER III.

SYMPTOMS.

It would be almost impossible to embrace each individual case in a general description; and in order to obviate this inconvenience, I will divide the subject into three parts, according:

1st, as the body passes along with the alimentary matters in their usual course; 2d, as it progresses more or less slowly and intermittently; 3d, as it remains fixed in some portion of the intestines.

1. Symptoms produced by Foreign Bodies which follow the Normal Course of Alimentary Substances.—By far the largest number of foreign bodies found in the intestines belong to this category; they are almost all inoffensive on account of their dimensions, which are not disproportionate to those of the tube which they traverse. As a rule, also, they only produce very slight symptoms, which do not attract the attention of the patients. How many individuals daily swallow kernels of all kinds, without adopting any precautions, and without being inconvenienced thereby. There is an infinite number of intermediate stages between this absolute benignity, which testifies to the tolerance of the intestinal canal and the serious complications produced by some bodies of an irregular shape. It is hardly necessary to say that the simplest symptoms are functional and subjective, and that a physical examination will not lead to any useful results without a clinical history. These symptoms, among which pain in a thousand varieties takes a principal part, occur in a very large number of affections, and are, therefore, not characteristic. During the process of digestion, the patient often complains of some colic pains, which do not remain at the same point for any length of time, and gradually pass on, with periods of calm and temporary exacerbations. Pressure upon the abdomen increases it, and, when very intense, it may give rise to tenesmus, cutting pains, retraction of the testicles, etc.

The character of the pain and its intensity are proportioned to the properties of the foreign bodies ; it is, therefore, more cutting if the object is a needle, and duller if the body is somewhat larger. As a rule, it ceases when the foreign body has passed through the natural constrictions and when the thickening of the alimentary substances protects the intestines against its pressure.

With the second category of intestinal foreign bodies we enter upon a less simple and more interesting study.

2. Symptoms of Foreign Bodies which progress more slowly than Alimentary Substances.—The characteristic of this variety is the slowness of the progression, which no longer follows the normal course of the food; hence it follows that such a foreign body will not be voided within a few days after its ingestion. Two circumstances are especially favorable to this denouement; on the one hand, a considerable volume or exaggeration of one of its dimensions, on the other hand, a very small size which permits the objects, such as grape, orange and melon seeds, kernels, etc., to be arrested at a certain spot. It is evident that these two conditions are opposed to one another, and act very differently, so that it is unnecessary to insist further upon this point. But the slowness of their advance is irregular, and is not subject to any law. The foreign body either progresses at first like the preceding ones, without any stoppages and without symptoms, and is then suddenly arrested by some valve, or by a normal or abnormal bend in the intestine (at a strangulated hernia, for example), or its volume or length produces obstacles to its advance from the very beginning, because it does not follow the intestine along its axis, and becomes placed crosswise. The progression will then occur in jumps and intermissions during an extremely variable space of time. The periods of arrest are measured by days or months, according to the individual case, but the principle remains the same. The remarks which I made concerning the influence of the cæcum as a place of election enable us to understand why foreign bodies are most frequently arrested at this point. The symptoms to which they give rise are subjective, functional, and objective.

Pain as a symptom.—As in the first category, pain constitutes the most important symptom; here also it occurs in all varieties, but it has one additional characteristic, viz., its persistence in a given spot during the entire period of its arrested progress. It commences higher or lower in some part of the digestive canal, increases upon pressure, and, in certain cases, presents great analogies with hepatic or nephritic colic. The ancients classed it among the so-called *miserere* colics. In addition to its situation, which may be very diffuse, we find, as in these diseases, a sudden beginning and almost sudden termination when the foreign body resumes its course, and it is rare that, after several paroxysms of variable duration in different places, the pain does not finally become fixed for a long time in the right iliac fossa. It is sometimes so violent as to give rise to epileptiform symptoms; convulsions and syncope are less rare when it becomes paroxysmal.

Side by side with this symptom, which dominates all the others and often gives rise to them, we observe functional disturbances proportionate to the intensity of the phenomena. The appetite disappears during the paroxysms, and is replaced by nausea, mucous or bilious vomiting, and hiccough. There is either constipation or serious diarrhœa; in some cases these symptoms follow one another. The passages may also be modified, and, in those cases in which the foreign body has wounded the walls of the intestine by some irregularity, we will find streaks of blood or pus derived from intestinal ulcerations if the arrest has been prolonged for any length of time. Under such circumstances some observers have even noted a black coloration of the stools, due to the solution of metallic foreign bodies.

As a final consequence of all these functional disorders, we must men-

tion the progressive emaciation and marasmus which then develop. They must be attributed to the excessive pain, and, in great part, to the disturbance of digestion produced by the presence of the foreign body.

These phenomena are not observed with the same intensity in all cases of arrested foreign bodies. They are found almost exclusively when the bodies are large, such as knives, forks, etc., and much more rarely in case of small foreign bodies with an intermittent course, which are arrested in the cellulosities, diverticula, or appendices. The latter are usually indifferent, but may reveal their presence in one or the other of their stoppages.

The passage into the rectum is the usual termination in this category of foreign bodies, and is consequently a fortunate one. When it occurs, all the symptoms cease, unless the intensity of the general disturbances prevents the recovery of the patients, an occurrence which is sometimes observed, and was also noticed in the following cases :

Observation by Gosselin.—Death after expulsion of a swallowed pipe.—(Communication to the Surgical Society, Oct. 17th, 1851.)—"A man, about thirty years old, of very good constitution, had contracted the habit, in order to make a few pennies, of swallowing foreign bodies of various sizes. About two months previously he appeared to have swallowed a clay pipe with impunity. This pipe was of ordinary size, was 10 centimetres long, had been smoked four times, and contained no tobacco. The patient won his bet, the foreign body being swallowed with facility; but when it reached the stomach, it gave rise almost immediately to severe pains, and then to vomiting and diarrhœa. The patient sought relief in the hospital of Saint-Germain; but after a stay of fifteen days, the symptoms continued as severe and frequent as previously. He was then advised to go to Paris, and entered the wards of M. Roux in the Hotel-Dieu. M. Gosselin, who was temporarily on duty, vainly endeavored to stop the vomiting and diarrhœa. The weakness became extreme, and the patient presented all the appearances of the last stages of phthisis. The tongue was red and dry, and vomiting occurred five or six times a day. M. Gosselin was very much embarrassed by such a serious case. Hévin's work contained observations of foreign bodies which had been removed from the stomach by gastrotomy; but though there were some precepts, there were no cases in the classical authors referring to those which were lodged in the intestines. Finally, in endeavoring to determine whether it would be possible to recognize the place occupied by the foreign body, M. Gosselin had recourse to the plessimeter, and, after repeated attempts, finally found marked dulness in the right iliac fossa, existing over a surface measuring about six or seven centimetres. There was no gurgling or tumefaction at this point, in which the pipe was, in all probability, situated. This examination had been made one evening. On the following day, M. Gosselin wished to determine whether he would find these signs in the same place, but the dulness had disappeared. During the day the patient passed the pipe through the anus perfectly intact, the stem not having been broken. But the organism had been profoundly affected, and the patient died five days later. At the autopsy no trace of redness was found in the stomach or small intestine; numerous ulcerations existed in the large intestine, some recent, others cicatrized or in process of cicatrization. There were false membranes on the convex surface of the liver and upon the diaphragm. Pleurisy and pneumonia were found upon the same side of the chest." (Union medicale, 1851, p. 491).

Observation.—Death after expulsion of a false tooth.—"Corbett (Dublin Quarterly Journal, 1855) reports the case of a very able and respected physician who, in the middle of March, complained of dyspepsia, torpor of the intestines, hemorrhoids, and abdominal pains. After having suffered from these symptoms for several months, he became persuaded that they depended upon the presence of a foreign body in the intestinal tract, a false tooth with its gold attachment having undoubtedly fallen into the stomach without his having known it. The pains were excessive, and he endeavored to relieve them by taking enormous doses of opium. By the end of August he was considerably emaciated, both from his sufferings, and from the enormous doses of opium which he had taken. One day, while sitting on a chair for the purpose of taking an injection, he heard the fall of a resonant object into the basin, in which he recognized a curved metallic plate, the surface of which was worn and blackened. At first he experienced some relief, but he continued to discharge mucous and san-

guinolent matter, and soon succumbed to the exhaustion caused by an ulceration of the intestines.'' (Journ. des médecins praticiens, 1856, p. 320.)

3. Symptoms of Foreign Bodies which are indefinitely arrested in some Portion of the Intestine.—It now remains for us to review the phenomena produced by foreign bodies which are arrested at a fixed point in the intestines. From what has been said above, it follows that these bodies have come from the stomach and have been arrested at a certain point after a primary progression ; or perhaps they have been formed or have become foreign bodies at the point at which they were arrested. The latter variety includes all intestinal concretions, stercoraceous tumors or enteroliths. The first are very large, and cannot pass through the ordinary orifices ; the others are usually smaller and lodged by chance in some cul-de-sac in which they remain indefinitely. Hence there is also a great difference in the primary manifestations. While the first, placed as a barrier in the direct course of the fæcal matters, have a profound effect upon the organism, the second, which disturb the digestive functions little or not at all, have only a trifling influence upon the general health. But we must not regard this as an absolute rule, because the concretions and bodies in the diverticula may undergo the change which we have already discussed, viz., a calcareous or feculent incrustation, which develops slowly, long after the ingestion or formation of the foreign body. In a general way, bodies arrested at the valves produce serious results, and those which are encysted in the intestines are comparatively benign. In the first case the patient experiences a pain in one spot, which is rarely intermittent, but undergoes exacerbations from a multitude of causes. Pressure, decubitus on that side, walking, riding, occupations which require an effort, simple digestion, etc., are among the causes which produce and increase it. Efforts at defecation, which are very vigorous on account of the frequent constipation in such cases, produce distressing paroxysms. The pain is not always acute, sometimes it is lancinating and radiates into the lower limbs and groins. We also observe tenesmus, cutting pains, and disorders of micturition—reflex symptoms which indicate a reaction upon the entire organism. Convulsions, syncope, nausea, vomiting, alternation of diarrhœa and constipation, a sensation of weight in the affected region, and fever have also been noticed. Even serous or purulent diarrhœa, which conceals the true nature of the affection, has been noticed. The anorexia and digestive disorders gradually produce emaciation and marasmus.

The objective signs are much less marked. Palpation sometimes enables us to detect the foreign body, but it does not always succeed, on account of another objective symptom, viz., meteorism. When the body is arrested at the ileo-cæcal valve, and obstructs the orifice temporarily or permanently, all the phenomena of intestinal obstruction become noticeable, viz., tympanites, bilious and then stercoraceous vomiting, the abdominal facies, a small, depressed, slow pulse, and constipation or serous diarrhœa. It then becomes very difficult to feel the foreign body. We may sometimes obtain valuable aid by means of percussion, and obtain, at a certain point, an abnormal dulness, which indicates the situation of the foreign body.

It is very interesting to compare the gravity of the subjective symptoms with the slight importance of the objective signs. Furthermore, this array of symptoms is not constant, and it also belongs to other

causes of intestinal obstruction—a fact which always renders the diagnosis very uncertain.

Small concretions and the enteroliths, lodged in a diverticulum, act differently from the beginning. They are remarkable for their indolence, and may acquire a very considerable size before interfering markedly with the intestinal functions. Their effects are very little known during this first period, and they do not attract the attention of the surgeon, except in consequence of the serious symptoms, which we shall soon consider. They do not interfere with the course of the intestinal contents as directly as the large foreign bodies which have come from the stomach, or as stercoraceous concretions, and we do not find the alternations of diarrhœa and constipation observed in the latter. In a similar manner the general health is much less affected, and the attention of the patients is rarely drawn to it. When it is, it occurs suddenly, because the period of indolence ceases, and gives place to complications which deserve a special study.

In a general way, all foreign bodies of the intestines, after they attain a considerable size, produce internal symptoms, disturbance of the functions of the organ itself, and of the adjacent parts, from compression of the vasculo-nervous plexuses, or ureters, or from displacement of other organs, such as the uterus, bladder, etc. In such cases the symptomatology is greatly modified, according to the nature of the complications.

CHAPTER IV.

THE FATE OF FOREIGN BODIES IN THE INTESTINES.—COMPLICATIONS WHICH THEY MAY PRODUCE.

All foreign bodies of the intestine may be included in the following categories:

1. The foreign body passes from the intestine to the rectum, by following the normal course of the fæces.

2. The foreign body progresses more slowly than the intestinal contents, with variable periods of arrest.

3. The foreign body is arrested at a certain point, and gives rise to various complications.

This division, as we see, is analogous to that which was adopted in examining the symptoms; it possesses the advantage of being founded on clinical facts, and of giving a precise idea of the accidents to which the presence of the foreign body may give rise.

From a pathological point of view, the gravity increases as we pass from one group to the following, and the last involves almost all the severer accidents, such as perforations, peritonitis, abscesses, phlegmons, etc. Such examples are, fortunately, very rare, and the first category includes the largest number of cases.

1. The Foreign Body follows the Normal Course of the Intestinal Contents.—If we reflect upon the large number of indigestible articles which men swallow, we are naturally led to consider that the intestine arrests very few. Thousands of persons carelessly swallow

fruit-pits without suffering therefrom. Even outside of these very small objects of alimentary origin, there are others which do not manifest their presence in the intestine by any complication. Thus, coins and pebbles rarely give rise to symptoms below the pylorus. Bardinet[1] reported the case of a woman, who had successively swallowed, in consequence of suicidal mania, pieces of glass, an etui, a key, and pieces of porcelain, without any marked symptoms.

Observation.—Blade of a knife swallowed, and passed in four days.—A girl, æt. twenty years, while having a knife in her hand, was surprised by a bold lover, and took to flight, holding the blade of the knife between her teeth. She fell to the ground; the blade, seven centimetres long, snapped, and was swallowed. This was followed by a profuse hemorrhage from the palate and pharynx.

When the physician saw the patient, the knife had already entered the stomach. Opium and a small quantity of solid food were administered. On the fourth day, a copious passage, in which the blade was found, already blackened and rusted. The color of the stools showed that the intestinal hemorrhage had been very slight. (Müller, in Schmidt's Jahrbücher, 1875., T. 167, p. 153.)

The Val-de-Grâce Museum contains a large, irregular piece of bone, which had traversed the entire length of the intestinal canal without producing any symptoms. A glance at this object will suffice to give us an idea of the strange tolerance of the intestines in certain individuals.

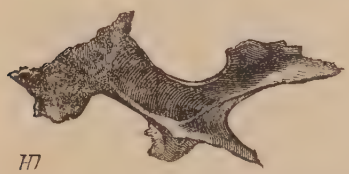

Fig. 25.—A very irregular bone, which was swallowed, and passed in the stools, without any accidents. (Museum of Val-de-Grâce.)

In the Bulletin of the Anatomical Society, Marcé published the history of a lunatic who, for the purpose of committing suicide, had swallowed a silver crayon-holder bent in two, which measured eight centimetres in length. It was expelled at the end of eighty-six hours.

These cases demonstrate the possibility of the passage of even large bodies, but they really constitute only curious exceptions.

2. Bodies which advance more slowly than the Intestinal Contents, with Periods of Arrest.—Those bodies act differently which, from various causes, travel slowly, by fits and starts, and sometimes occupy a considerable length of time in traversing the various portions of the intestines. Whether large or small, they owe this intermittent course to their shape. But, even in their divergence of shape, there is a certain proportion which produces slowness in the progression of the longer and larger bodies, as in those of the smaller ones. In this way, for different reasons, a fork or spoon will act like an orange-seed which is temporarily arrested. We have found that foreign bodies, when they are of small size, produce no effect, and are manifested by no symptoms. This is not the conduct of the first, which are usually large, perfect strangers to the digestive tract—if I may so express myself—and which may produce very serious complications during their passage.

Acute enteritis.—Enteritis, under various forms, is most frequently observed, and is acute in some cases, with fever, abdominal pain, tympanites, increased local sensibility. A period of constipation may be followed by a serous, fetid, sometimes lienteric, diarrhœa, when the foreign body remains in the middle portion of the intestine. The affection may even exceed this intensity and assume more severe forms.

[1] Société de chirugie, 1859.

Ulcerated enteritis.—We may find ulceration of the valves, epithelial desquamation, and suppuration of a portion of the canal. The symptoms then change somewhat, become aggravated, and are accompanied by nervous phenomena. Thus convulsions, epileptiform attacks, etc., have often been noticed in such cases. But the characteristic peculiarity of this ulcerous enteritis is the alternation between constipation and purulent diarrhœa. The presence of pus always indicates ulceration. If the stools are black, in consequence of the structure of the foreign body, we can form a much more precise idea of the cause of these accidents. The intermittence of the phenomena is readily explained, either by the successive progression of the body which resumes its course as soon as the opposing obstacle is overcome, or as soon as it has assumed a position which enables it to make its way through the intestine. From the statements of authors, it appears that the foreign body resumes its course by overcoming obstacles to its movement. This has been very clearly demonstrated by autopsies upon persons who have died during the process of expulsion or very shortly afterward.

In such cases the ileocæcal valve has been found ulcerated, thickened, and even destroyed—sufficient evidence of the ulcerative process to which nature has resorted in order to aid the passage of large foreign bodies. At more or less distant points we also observe cicatrices, and traces of old ulcerations which have recovered after the removal of their cause. M. Gosselin's case of a clay pipe, quoted above, is a striking example. In Caron's case[1] the symptoms were produced by cherry-pits which had been arrested for twelve years. At the autopsy two strictures and cicatricial bands were found in the intestines; ulcerations were also present.

Subacute peritonitis and plastic peri-enteritis.—Another complication of foreign bodies, or rather another effect of their passage, is the formation of adhesions between the various layers of the peritoneum, and consequently between one or more loops of the intestines. At other times the adhesion occurs with the abdominal wall or an adjacent organ, such as the liver, spleen, bladder, etc. The mode of formation of these false membranes is very simple; it is readily explained by the enteritis to which we have referred, and by the propagation of the inflammation to the peritoneum. But it rarely happens that the cause is sufficiently long in action to produce a subacute inflammation. The peritonitis is also very mild, compared to that which we find developing when the foreign body is permanently arrested. Nevertheless, though these adhesions are not very dangerous primarily, they are always followed by serious lesions, which produce a constant functional disturbance by diminishing the physiological movements of the loop of intestines.

We very rarely find abscess or circumscribed phlegmons developing if the foreign body advances intermittently. The object usually reaches the rectum, after a variable number of stoppages.

Duration of the stay of the foreign body.—It is an interesting part of the study of these foreign bodies to determine their length of arrest, the period which elapses between their arrival in the duodenum or their formation, and their passage into the sigmoid flexure. This period can evidently not be determined exactly, because we do not know, on the one hand, the precise time at which it left the pylorus, and, on the other hand, that at which the concretion was formed. Nevertheless, observation enables us to determine that this period may be very long. Several years

[1] Bull. de la Soc. anat., 1855.

have been known to elapse, with alternations of suffering and rest, before knives or forks have overcome all obstacles.

Observation.—A Spanish officer, æt. 41 years, swallowed a fork with which he was scraping the root of his tongue. It was passed with the stools a year and three months later (454 days) without any noteworthy symptoms. (Planque: Bibl. de médecine, T. III., p. 558, 1750.)

In some exceptional cases the period of arrest may reach the extreme limits of ten or twelve years; it usually occupies months, and the passage is effected in less than three or four months.

3. Foreign Bodies which are permanently lodged in some Part of the Intestine.—The foreign bodies, which are permanently arrested at one point, whether they come from above, or are formed like certain tumors of stercoraceous origin, present very great variations with regard to their progress. In order to describe their history methodically, I shall arrange all the facts concerning them into seven sections.

1. Tolerance of the intestine for the arrested foreign bodies.
2. Changes which may occur in the foreign bodies.
3. Lesions which may be observed in the intestines.
4. Phenomena of obstruction.
5. Primary perforations and the symptoms which they may cause.
6. Inflammatory complications of foreign bodies.
7. Secondary fistulæ.

1. Tolerance of the Intestine for the arrested Foreign Bodies.—The tolerance of the intestine has long been admitted by all authors, and the journal reports of autopsies in which foreign bodies or solid substances are found confirm this view.

Observation.—Case of tolerance in the vermiform appendix.—Lewis (N. Y. Medical Journal, Nov., 1856) made an autopsy upon a man who died at the age of 88 years, and in whose appendix vermiformis 122 grammes of lead were found. This man, who was a great lover of hunting, had never, during life, presented the least symptom which would lead to a suspicion of a lesion of this organ.

But what is the degree of this tolerance? This is very difficult to determine. If we reflect upon the continual imminence of severe accidents which may be the result of the most varied causes, we will understand that it must be very restricted. Whether the obstruction is mechanical (stercoraceous tumors, with or without organized elements, ingested foreign bodies) or the bodies are lodged in the appendices, the solid or semi-solid substances which remain in the intestines almost always produce a disturbance in the general health after a variable length of time. The victims of their presence are exposed to a host of accidents, the most trivial of which are the functional disorders mentioned under the head of symptomatology, while the severest are intestinal obstruction, perforations and phlegmons. Thus, while admitting the possibility of absolute tolerance, we must remember that it is not indefinite, and that, especially in cases in which the obstacle is situated in the intestine itself, it may become dangerous. I know that observations are not wanting to prove that large concretions have been tolerated for a long time. Cruveilhier has even reported one, forming a veritable pudding of cherry-pits and fæculent matter, and burrowed with holes, which allowed the passage of digested substances. These curious cases only strengthen our statements concerning temporary tolerance. Another proof of tolerance consists in the incrustation of bodies of foreign origin and in the formation of the enteroliths of which I have spoken.

2. Modifications which arrested Foreign Bodies may present.—In discussing the nature of intestinal foreign bodies, we have already spoken of enteroliths and the calculous products which may be met with. We should now state the conditions under which they are usually formed and by what mechanism these calculi are produced. In the first place, we have seen that they almost always possess a centre formed of various objects, either organized (pits, kernels) or amorphous (indigestible alimentary substances). This is the first, but not absolutely indispensable condition in the production of these stones, which are half calcareous, half stercoraceous, but which is found in the large majority of cases. A second condition, which is much more necessary, is a very prolonged stay in the intestinal canal. It requires several months, and sometimes even years, before a body becomes incrusted in the intestine. On account of the incessant nervous action produced by the presence of the object, the nature of the secretions changes and permits this stony formation. If we do not regard their genesis as a reflex process due to alteration of the secretions, it is very difficult to understand how the carbonate, phosphates, or sulphates of lime and magnesia will be deposited upon a cherry-pit or upon the husks of oats, unless we prefer to admit a sort of selection of these salts by certain bodies, a theory which is much less admissible.

It is to be remarked that calculous concretions always develop around organized bodies, and that their existence around inorganic ingested bodies has been very rarely observed. This peculiarity is perhaps explained by the fact that the calculi are formed in recesses or culs-de-sac, which are precisely the places in which the organized bodies in question are lodged. Moreover, this also holds with regard to concretions which are incrusted with calcareous salts. We also find that the cæcal appendix alone furnishes almost two-thirds of the number of intestinal calculi, probably because it is a constant diverticulum. The necessity of a pouch to shelter the body which is becoming incrusted is evident, as it allows us to explain the deposit of successive calcareous layers. In fact, these deposits are not carried off by the digested substances, and, when the latter reach the calculus, they enclose it, surround it, and produce the parti-colored stratification which is so frequent. May we not regard the difference of situation between metallic bodies, for example, and organized bodies, as the cause of this different process, since the former often develop into enteroliths, the latter rarely? We cannot deny a certain influence to this continuous action of substances which prevent saline deposits upon movable bodies of the intestines. This is proven by the fact that if, on account of its shape, a metallic body has become engaged in some recess, such as the vermiform appendix, it will become incrusted with calcareous and stercoraceous matters, as Peter observed in one case, in which a concentric cylinder formed around a needle which had entered the appendix.

Solution of foreign bodies.—Ingested foreign bodies, if they are metallic, as is very often the case, may act in a different manner. Not only do they not become the centre of calculi, but they themselves may be attacked, if the digestive fluids have any action upon the metal. We have already seen that of all metals iron is the one which undergoes the most profound changes during a prolonged stay in the intestines. Next comes copper, which is much more resistant, then lead, etc.; some metals, like gold, are unchangeable. This action may be sufficiently intense to modify the shape and properties of the object; it may, in this manner, blunt the points of pins and needles, cause a fork to break at its narrowest part,

and these consequences may be of the first importance, as is shown by the following observation:

Velpeau's observation.—A swallowed fork.—A man swallowed a bone and afterward his fork. He came from Saintes to Paris to seek advice. The expectant plan was recommended. Upon his return home, it was found that the fork was in the greater cul-de-sac of the stomach, the teeth being turned to the left side. The patient suffered intolerable pain, and was hardly able to take any nourishment. The foreign body remained in this position for fifteen days, and was then directed toward the pylorus, where it remained more than four months. Black vomit, excessive pain, disturbed digestion. It passed the pylorus and then through the small intestine in six weeks, when it lodged in the right flank for three months. The patient continued to suffer, and, upon palpating the abdomen, the teeth of the fork could be plainly felt. After remaining on the right side for five months, the fork began to dissolve. Colic, blackish and brick-colored stools. Constipation. Symptoms on the part of the genito-urinary organs. The pains soon became less intense, and the patient could satisfy his voracious appetite. Finally, twenty months after ingestion, he passed a large piece of the fork in the passages; this was the part included between the tip and the prongs. Disappearance of all the symptoms. Recovery.

Facts of this kind are not very rare, though less fortunate and evident, it is true.

Observation.—Thirteen screws in the intestinal tract.—Recovery.—A woman, æt. 43 years (having previously made many suicidal attempts), on July 31st, 1875, swallowed thirteen screws, each screw consisting of a body two and a half inches long and one and a half inches thick, a raised collar nearly three-fourth inch in diameter, and a square head, the whole thirteen screws weighing twenty-four ounces. She was fed on pudding and gruel, morphia was injected subcutaneously to relieve pain, and, after a few days, ounce doses of castor oil were given daily. On the forty-first day the first of the screws passed by the bowel, and, by the end of the sixth month, the last came away. The screws in their passage had lost four and three-quarter ounces in weight. (Bryant: The Practice of Surgery, Vol. I., p. 619.)

Another change has been mentioned by some authors—I refer to the germination of the seeds of cherry or other pits. These facts have been authentically reported several times, and, in some cases, have thrown light upon the precise data by which we could trace back the symptoms observed.

Observation.—Sprouting kernels.—Landais relates the history of an individual who passed four hundred cherry-pits in his stools. Among them were several which had evidently begun to sprout. The shell had burst open, and a germ several lines in length had sprouted from the seed. This germ and the seed to which it was attached had dried down, while the tissue of the others had undergone no change. (Ancien journal de médecine, T. 37.)

3. Lesions which may be noticed in the Intestines.—It is quite rare that a foreign body remains for a certain length of time in one part of the intestine without marking its presence by profound changes. The simplest of all is the formation of intestinal pouches of various sizes, at the expense of one of the walls of the organ. Must we attribute this to the centrifugal tendency which nature assumes, whenever it is necessary to get rid of a body which interferes with her functions?

Is it not more rational to believe that the weight, the peristaltic contractions, and favorable anatomical conditions play the principal part? It is preferable to accept this explanation of the circumstance, because foreign bodies act in this manner in other cavities. However this may be, the dilatation may extend all around the wall in some cases, and we then find a true ampulla whose limits are only regulated by the elasticity of the intestinal walls.

Stercoraceous tumors, for example, may act in this manner. But very frequently the pouch is more defined, is found upon one side of the intestine, and the body is enclosed in a diverticulum, as it were. From this time on, it is found under favorable conditions for incrustation or calculus formation, and the chances of obstruction diminish. In return, this benefit is opposed by the imminence of inflammatory symptoms on the part of the peritoneum, from which the calculus is only separated by a portion of very thin intestinal wall, enclosed in a slightly infiltrated cellular tissue, which is very prone to propagate inflammation.

It suffices to recognize the possibility of this phenomenon in some cases, and to consider it as the first period of a cyst-formation, of which but few examples are found.

Ulcerations.—But there are bodies which, on account of their size, number, and shape, can never leave the axis of the canal, and are continually arrested despite the vain efforts of nature. These bodies include knives, forks, concrete masses of all kinds of kernels, and even enteroliths which have arrived at complete development. Here we must not expect the development of pouches; it is evident that the intestine, being continually subject to the action of the foreign body which presses upon it in all directions, is irritated and gives rise to spasmodic contractions.

The first effect produced is hypertrophy of the intestinal muscular coat, which may become tripled in thickness. At the same time, as there is sometimes a temporary arrest of fæces, the intestine becomes more or less dilated; these are the macroscopic lesions. Internally, the mucous membrane presents all the signs of the various stages of enteritis. At the onset it is simple and is manifested by congestion. At a later period, the cause continuing to act, it becomes ulcerated, and the entire portion of the intestine situated above the metallic or organic body, a knife or concretion, whether smooth or rough, is merely one vast ulcer. At this period we observe severe diarrhœa containing pus. At this time, also, the functional disturbances attain their maximum (vomiting, hiccough, colic), and the emaciation and marasmus threaten the life of the patients.

All these lesions, both the external and internal ones, afterward give rise to true organic strictures of the intestine, which greatly embarrass pathologists, if they have not recognized their causation. In a large number of autopsies these intestinal strictures were present at the site of the body, and Pollok (Holmes) noticed them a long time ago. I will quote a striking example from the treatise of the latter author:

Observation—Stricture of the intestines.—Clement, of Shrewsbury, operated on a patient who suffered from an intestinal obstruction, for which he was compelled to open the ascending colon. The result was so advantageous that at the end of six weeks she was able to walk. But a week later severe colic appeared, with obstruction of the artificial orifice, which was suddenly terminated by the expulsion of a hard mass. This substance was composed of five plum-pits firmly bound together. They were followed by sixteen others and an abundant evacuation. On the following day three pits and two bones were extracted. At her death the number of pits collected amounted to one hundred and sixteen. The cæcum and colon were found to be of immense size; at the transverse portion it was suddenly interrupted by a very close stricture. The occlusion could not have been more complete if a whip-cord had been strongly tied around this part of the intestine. The remainder of the intestine formed a narrow, flabby tube. The stricture had a cartilaginous consistence, and the occlusion of the canal was so complete that it would not admit a hog's bristle. The constriction had a pearly white color, and did not appear more vascular than a tendon. (Trans. Med.-Chir. Soc., Vol. 25, p. 209.)

In this case, as in a large number of others, the question of the origin

of these strictures remains undecided. Did it exist prior to the foreign bodies? This is difficult to determine.

But at the same time that the enteritis passes from a simple to an ulcerated condition, an inflammatory thickening is produced by infiltration into all the coats of the intestines. The inflammation gradually extending to the adjacent intestinal masses, we may, by palpation, determine the existence of a tumor which always embarrasses the surgeon, who is often far from suspecting the presence of large stercoraceous concretions, since he is led astray by the existence of diarrhœa. Ulcerations of the intestine are very frequently present, but they do not always assume such an extensive and serious form. The shape of the ingested body often determines the size of the gangrenous ulcer which it produces by its pressure. On the contrary, large bodies, such as certain concretions or enteroliths, may produce circular or annular wounds, which granulate and do not cicatrize. Death sometimes occurs at this period, being produced as much by the exhaustion consequent on the suppuration as by the inanition and marasmus. How often has the autopsy revealed the true cause of a series of symptoms, which deceived the patient and led him into error; so insidious are the course and symptoms of the foreign bodies which remain fixed at one point in the intestines, and so surrounded with numerous difficulties is the diagnosis!

4. Phenomena of Obstruction which may be produced by Foreign Bodies.—This grave complication is not very rare, and is very often caused by the presence of foreign bodies. This does not imply that the body itself primarily produces the obstruction in all cases, but it constitutes a powerful predisposing cause by producing constipation, by obstructing the free passage of substances, and by modifying, as we have seen, the structure of the intestine, which becomes less elastic, thicker, swollen, and forms a ring of stricture at the position of the obstacle.

If a foreign body can produce such serious lesions in a healthy intestine, how often will its action become even more dangerous when it acts upon a hernial portion of intestine which has passed through some orifice or which is the site of angular adhesions? The chances of obstruction then increase very much, as is proven by the numerous examples of strangulated hernia after the arrest of foreign bodies. The progress of the obstruction differs slightly in the two cases, the conditions not being the same, and I will review each of them.

1. *Obstruction of a free portion of the intestine.*—Among the foreign bodies which may produce obstruction, we find a considerable number of cherry, plum, and apricot pits, the little bones in a leg of mutton, etc. In addition, rings, portions of sets of teeth, pins, knives, pieces of a chicken's bones, and enteroliths also act as a cause of obstruction to the passage of substances through the intestines. Some, like needles and fish-bones, act, by becoming imbedded in the walls, as a nucleus upon which indigestible matters are deposited which gradually form stercoraceous tumors. Others, like coins, lead bullets, balls of antimony, earth balls, pieces of an œsophageal sound, Denans' brass collars for intestinal suture, act by promptly producing almost complete obstruction (Piriour: Thèse de Paris). Finally, we must add to these facts those which are reported by a number of authors, and which refer to foreign bodies, which, from their very nature, produce obstruction.

Observation.—A young idiot was continually chewing cocoa-nut shells. For sixteen years this habit had produced no accidents, when he became affected with intestinal obstruction, and died. A mass, as large as a hen's egg and composed of fibres of the

cocoa-nut shell, was found completely obstructing the ileum twelve inches above the cæcum. (Langdon Down : Trans. of the Patholog. Society, 1868.)

Observation.—Intestinal obstruction by a mass of hair in a young girl.—Death.—(Dr. Teft.)—A girl, æt. seventeen years, of a sickly appearance, had for a long time been in the habit of swallowing all sorts of objects. When fifteen years old, she had had her menses twice in succession, since which time they had not reappeared. The girl became sick, and complained of cardialgia and cephalalgia ; vomiting and diarrhœa supervened, which caused great emaciation and marked failure of the vital forces. The vomiting increased to such an extent as to interfere with nutrition. The abdomen gradually became painful on pressure, and it was found to contain a slightly depressible and very indolent tumor, hard, cylindrical, and without fluctuation, which occupied the entire space between the anterior portion of the ninth rib and the anterior superior spinous process of the ilium. This tumor gave a dull sound, while the rest of the abdomen was resonant. Treatment was ineffectual ; the vomiting soon became stercoraceous, constipation complete, and death occurred. At the autopsy it was found that the tumor was formed by the ascending colon and the cæcum, which were filled by a large foreign body. This mass was flattened in its upper part by penetrating into the ilium through the ileo-cæcal valve, was 15 centimetres long, and composed at its lower part of a mass of cotton ; the part which penetrated into the ilium was composed of all kinds of hemp, thread, and bits of string (Schmidt's Jahrbücher, 1867, T. 135, p. 74.)

As the symptoms of obstruction do not differ in such cases from those observed in ileus and volvulus, a sketch of the symptoms produced will suffice. The symptoms either develop suddenly, or they are heralded by slow prodromata. In the latter event, we observe previous disorders of defecation, constipation, followed by diarrhœal flux. After several relapses and in the midst of these functional irregularities, the abdomen becomes tympanitic, is painful, especially at one point, and the passages are suppressed. All these symptoms disappear spontaneously or under the mildest medical interference. The symptoms then increase, and we are again face to face with complete arrest.

But if the latter begins suddenly, the symptoms quickly attain a great intensity, and the affection is soon manifested by a disturbance of the entire economy. The first symptom perceptible after the pain is abdominal tympanites above the obstructed portion of the intestine. It is due to the accumulation of gases, which form in great abundance in such cases and gradually produce a considerable distention of the intestinal walls. The incomplete insertion of the mesentery upon the intestine enables us to comprehend how this organ can undergo such dilatation. This tympanites was known to the ancients, but it was especially Laugier who, toward the year 1840, drew attention to the changes in the shape of the meteorism according to the situation and extent of the obstruction. He had remarked that the form of distention varied according to the situation of the obstructed point; that when the obstacle occupied the jejunum, the meteorism was especially situated above; that, on the contrary, it was more extended and uniform when the arrest occurred near the cæcum.

Unfortunately these facts are not always verified in practice, and it is very difficult to determine, even with a very large approximation, the precise situation of the obstruction. Surgeons have sometimes been on the point of operating for hernia of the ileum which was regarded as the cause of symptoms that were in reality produced by obstruction of the sigmoid flexure.

Pain is often the first symptom, but it does not attract the attention of patients who are subject to colic. As soon as the obstruction is confirmed, it is at first manifested by inodorous and slightly painful, gaseous eructations; the respirations become more labored and painful; the saliva

collects in abundance in the mouth, and a vague feeling of malaise gradually increases. At the end of a few hours, sometimes after a day or two, emesis appears, at first without any peculiarities, being composed of food and drink, and especially of mucus and bile. The appetite is almost entirely lost. At this period the tympanites becomes alarming, and is shown by the resonant tumor. Some gas and fæcal matter may still continue to pass through the anus, and put us on the wrong scent with regard to the true cause of the affection. Even when the fæces have been completely rejected, mucous passages still occur, together with expulsion of some gas; they constitute the products of intestinal secretion. The vomit is at first mucous, and then becomes bilious and yellowish, and has an acid odor.

As the affection pursues its course, the color of the vomited matters gradually becomes darker, and may even exceed the green color to assume a black tinge. The odor changes at the same time; at first markedly acid, it becomes penetrating and disagreeable when the vomit is bilious, and fæculent when the vomited matters are black. Is there any relation between this color and the situation of the obstruction? Up to a certain point we can evidently determine the situation of the obstacle by remarking that an obstruction of the first part of the small intestines will not give rise to fæculent emesis. In the same manner the matters are greener the more remote they are from the large intestine.

Anxiety increases, the pulse becomes harder, smaller, and more frequent. The bilious and stercoraceous vomiting is the result of a series of very painful, convulsive anti-peristaltic movements. The face reflects this suffering; it is pale and distorted; the body is covered with a cold sweat; the eyes are sunken, and the nose peaked. All movements become very painful, and the patients must remain immovable.

Though the largest number of these symptoms are present in all cases, they may be wanting, or be somewhat different. The pain is the most variable of all—sometimes intolerable, sometimes dull, and may even present intermissions, moments of calm, which hardly ever correspond to an improvement in the local condition.

The stercoraceous vomiting is followed by hiccough, which is a symptom of very bad omen, and usually announces a fatal issue. The temperature is lowered, the pulse becomes filiform and irregular, the voice is extinguished, and the eyes are surrounded by a livid circle. Death occurs without delirium after a long death-struggle. The course of the affection is very slow, except in acute cases, when it runs its course in fifteen or twenty days. Such is the ensemble of grave symptoms produced by the obstruction when death results, which, unfortunately, occurs very frequently. If art intervenes in time, or if nature re-establishes the passage, all the symptoms improve and health is restored, if the general condition has not been too seriously affected.

When death occurs, it may be the consequence: 1st, of a solution of continuity in the intestine at the obstructed point. It very frequently happens that the foreign body gives rise to perforation and foudroyant peritonitis. 2d. The intestinal walls may become softened and gangrenous at the site of the obstruction and above it. The dilatation produced by the accumulation of substances under the form of a semi-doughy column above the obstacle, and the excentric pressure to which these masses give rise, sufficiently explain the production of the gangrene. It never runs its course completely, and, upon autopsy, the small intestine is found bluish, slaty, friable, and tearing under the finger or upon the

slightest traction. There are very poorly defined boundaries between it, the peritoneum, and the adjacent loops of intestine which take part in the lesions. The entire mass exhales an extremely fetid odor, which adheres to the hands with great tenacity. The inner surface is also the site of softening and frequently of very deep ulcers; but the portion below the obstruction presents a singular contrast to the latter. In place of tympanites, we find a diminution of calibre; instead of a mass of fæcal matter, we find the intestine entirely empty, atrophied, and shrivelled up.

Observation.—Intestinal biliary calculus.—Obstruction.—Death.—A young beggar, æt. 14 years, entered Vernon Hospital for an iliac tumor, which had been neglected. He rejected fæces by the mouth, and had very fatiguing, continuous hiccough. He died the following night.

Autopsy.—The small intestines very much dilated and gangrenous in great part. The ileum was entirely occluded by a very large quantity of excrement, which was so hard that, when thrown upon the table, it sounded like a stone, and took fire like biliary calculi. (Rec. d'Obs. méd. milit., 1772, p. 625.)

A few remarks will not be out of place in order to explain the entire train of symptoms following obstruction. It appears from certain observations that stercoraceous vomiting constitutes a means employed by nature to overcome an obstacle which cannot be expelled through the lower parts of the intestine. We thus find that an accumulation of cherry-pits has been rejected, after several attempts, with the stercoraceous matters. The patient had expelled fifteen up to death, and, when the autopsy was made, it showed that the obstacle to the course of the substances was insignificant, and was only composed of five or six cherry-pits which had been arrested by a stricture of the intestines. In another case,[1] a patient, suffering from obstruction, vomited a large number of pits of the same fruit.

Similar facts are not wanting, and it is reasonable to consider all these anti-peristaltic efforts as a natural remedy.

2. *Obstruction of an intestinal herniæ.*—We have purposely overlooked, in the previous remarks, the foreign bodies arrested in herniæ. Their history is so peculiar that it is best to isolate them, because the symptoms as well as the accidents vary greatly. The arrest of foreign bodies in herniæ has been recognized for a long time, and Hévin had mentioned several cases in his treatise. Fruit-stones, pieces of bone, fish-bones, pins, intestinal worms, stercoraceous concretions, and enteroliths have been found in them. It is hardly necessary to insist upon the great predisposition of herniæ in this respect and upon the gravity of the situation. When the body is once arrested, it may give rise to a series of symptoms, of which temporary pain is the simplest expression, and which may also result in death. These symptoms include:

1. Pain; 2, obstruction; 3, inflammation; 4, gangrene.

1. Pain is frequently present as a symptom of the arrest of foreign bodies in herniæ, especially when the latter are irreducible, but it does not usually attract attention, because the simplest means enable the obstacle to be overcome. This is no longer true if the body remains in the hernial sac for any length of time. The pain then becomes alarming, and is the prelude to other symptoms.

2. Obstruction is very often observed in herniæ which are usually reducible, and it may be caused by the presence of foreign bodies. At

[1] Journal général de médecine.

the site of fruit-stones, concretions, or pieces of bone, an arrest of fæcal matters occurs which irritates the intestine, the neck of the sac, and produces a very remarkable ensemble of symptoms, because it resembles derangement of the stomach at first.

The tongue is coated, the patient suffers from a feeling of heaviness in the head, anorexia, an indefinable feeling of malaise, nausea, and sometimes even mucous or bilious vomiting. We must carefully inquire into the condition of the stools, which are suppressed or very infrequent. In the presence of this array of symptoms, which have suddenly developed in a man who otherwise enjoys very good health, the surgeon should think of the possibility of a hernial obstruction by fæcal matters or other foreign bodies.

3. *Inflammation and obstruction.*—It is convenient to collect these complications in the same paragraph, because when foreign bodies occur in the herniæ they are hardly ever separated, one of them giving rise to the other. They are always serious, and rarely terminate in resolution. In the most fortunate cases, enterotomy has put an end to the symptoms, as in the following cases :

Observation.—Strangulation of a hernia caused by the foot of a lark.—" A cook, inconvenienced by a hernia, which readily protruded, began to suffer one day from very violent vomiting, and feeling very acute pains at the side of the hernia which he had in vain endeavored to replace, operation was advised, to which he did not consent until the surgeon and myself no longer wished to operate. Sympathy, stronger than fear, determined us to perform the operation ; we found the gut traversed in the hernial sac by the leg of a lark which he had swallowed." (J. L. Petit, Maladies chirurgicales.)

In such cases the obstruction and strangulation coincide. It is difficult to determine the part played by one or the other. However, we especially observe obstruction when the foreign bodies are small and numerous, or when they are large and *ipso facto* constitute an obstacle to the normal passage of intestinal contents. On the contrary, inflammation and strangulation often supervene when the foreign body is single and wounds the walls by an irregularity.

Observation.—Pin contained in a strangulated hernia.—" Planque (Bibl. méd., T. I.) reports that Carboneau observed the case of a lackey affected with strangulated scrotal hernia, and in whom the scrotum was perforated by a pin. Carboneau broke the pin with forceps. The head was afterward passed with the excrement, and the patient readily recovered."

Observation.—A man, who had an old hernia, died, after having presented symptoms of obstruction and strangulation, which had disappeared. At the autopsy, an earthen egg-cup was found in the reduced hernia, in the small intestine. The gut was ulcerated, and there were adhesions between the layers of the peritoneum. (Poland : Guy's Hospital Reports, 1863.)

There are a very large number of cases of hernial strangulation and obstruction on record. The symptoms are well known, and have been mentioned above ; it is therefore useless to repeat them.

4. *Gangrene.*—It may result from the preceding conditions, in which event we must regard it as the last stage in the development of these various accidents. But it may also develop very rapidly, and almost immediately after strangulation. A sort of subacute inflammation is then produced.

Observation.—" Farcy, a surgeon of Flèche, was called to see a porter who had suffered for eight years from an incomplete inguinal hernia, which he could readily

restore. This hernia had increased considerably and almost suddenly; the patient manifested the symptoms of strangulation. Farcy did not dare to reduce the hernia, on account of the great hardness which he felt in the tumor and which resembled bone. The surgeon bled several times during the first few days; enemata, emollient poultices for first four days, no softening. The operation of the bubonocele was proposed, but the patient did not consent until suppuration occurred around the hernia, when Farcy opened the tumor. He drew from the hernial sac some badly formed pus of an intolerable odor. The ileum was found to be gangrenous. The surgeon was very much astonished to extract some small bones which were recognized as coming from a leg of mutton; upward of sixteen were withdrawn in two or three trials. The porter had swallowed them the night before the accident. Stercoraceous matter escaped from the wound for some time; they then followed their usual route, and the patient had entirely recovered without a fistula on the thirty-third day. He returned to work as if he had never been sick." (Mém. de l'Académie royale, année 1722.)

It would be difficult to find a more striking case of the production of hernial gangrene; we could collect a large number of such cases, though slightly different. M. de Boismortier, quoted by Hévin, extracted from a gangrenous hernial loop a stalk of barley with all its calices. In conclusion, I will report Denonvilliers' case, which is even more curious.

Observation.—Cherry in a hernial sac.—"Denonvilliers presented to the Academy of Medicine, in 1842, the specimens obtained at the autopsy of an old man, æt. seventy years, who died of strangulated crural hernia. The hernia was strangulated at its first appearance, as the patient had not been ruptured previously. When operated upon, the tumor was red, painful, and absolutely irreducible, the pulse small and frequent, the facies miserable.

"At the autopsy the hernia was found to belong to the small intestine. It contained a small object, which was recognized as a brandied cherry. There was a very small perforation at the site of the cherry." (Bull. de la Soc. anat., 1842, p. 125.)

This is a case of very rapid gangrene which produced fatal peritonitis; we could multiply examples of this kind, but to no advantage. It will suffice to have shown the extreme gravity of cases of this kind, the difficulty of diagnosis, and the embarrassment of the surgeon when confronted with these symptoms. In the chapter on treatment I will refer to the best practice in such cases.

5. Primary Perforations, and the Accidents which they may produce.—The unusual course of certain foreign bodies arrested in the intestine has induced me to detail their history in a special chapter. I refer to primary perforations, that is to say, to those which are not due to an inflammatory process, but which, on the contrary, develop within a little while after the ingestion of the foreign body. Their onset is sudden, and is explained by the shape of the object. In fact, almost all cases of this kind refer to pointed pieces of bone, to pins or needles, the conformation of which favor this rapid course. But the phenomena always occur in the same manner, and, without being more precise, we must regard primary perforations as a grave event, which may lead to a fatal issue.

The mechanism of the perforation is so readily understood that we need not insist upon it. The foreign body, being pushed, like other substances, by the intestinal contractions, is imbedded in the wall and then traverses it. But the perforation may occur in various ways, according to the impact of the body with regard to the wall, according to the part of the intestine which is perforated, and according as the peritoneum is or is not situated at this point.

These are interesting questions, but have hitherto been imperfectly

investigated. However this may be, we may refer to four methods of termination in primary perforations:

1. The foreign body does not produce any symptoms.
2. Formation of a non-phlegmonous tumor.
3. Formation of a phlegmonous tumor.
4. Subacute peritonitis and death.

1. *Tolerance of the perforating foreign body.*—The first group includes, perhaps, a larger number of examples than we might be inclined to believe; but we can understand that the absolute tolerance manifested toward bodies which are thus left in the abdomen allows them to be passed over in silence. It is only in exceptional cases that we observe them upon autopsy. This happened to Petit, who found a needle in the mesentery of a woman who was hung. I have previously reported no less astonishing cases of the migration of needles after perforation of the intestine. At one time the needle is found under the skin of the thigh, and again in the testicle, in which authors state that it has produced a carcinomatous tumor. Petit states that he saw an ingested needle which had descended to the foot, and made its exit eighteen years afterward. We cannot fail to be astonished at reading that Hertz, Planque, Birth, Silvy, Villars, and Otto have observed cases in which three or four hundred needles, and even more, had perforated the intestines, and become scattered in different parts of the body.

Observation.—Migration of a needle found in the liver.—In 1856, a woman, æt. 46 years, entered Saint-George Hospital, in Leipzig, in the service of H. Clarus. She died at the end of twenty-five days in a condition of marasmus, without any other symptoms than insomnia, excitement, emaciation, and diarrhœa during the last few days. At the autopsy a thickened cicatrix was found in the shallow groove, formed by the union of the right and left lobes of the liver, the cicatrix extending in an antero-posterior direction, like the groove. The tissue of the cicatrix was white, and was three and a quarter inches long, and two lines broad. It was very dense, and contained a piece of a knitting-needle three inches long, which it had surrounded in such a manner that it was extracted with difficulty. The needle itself, when rid of organic matter, was found to be very much worn by rust. It was only unequal at one point, and had preserved its cylindrical form and smooth surface. A large venous trunk, which presented no change, was found almost immediately below it. No trace of a previous wound could be found upon the integument of the abdomen, in the stomach, or even the liver itself. The relatives of the patient could furnish no data in this regard. (Arch. für phys. Heilk., and Gaz. hebd., 1857.)

Observation.—Closmadeuc (Union méd., 1874) reports the case of a young girl who, on a wager, swallowed a spool of thread which was traversed by a needle. The spool was passed eight days later; the needle gave rise to pain, after a lapse of six months, in the middle of the thigh, whence it was extracted through a wide wound.

Dieulafoy reports that a needle which was swallowed by a young girl, passed out through the vagina.

We must unreservedly admit the possibility of primary perforation with integrity of health, and we have in mind Petit's case of the woman who was hung, and in whom a needle was found at the insertion of the mesentery into the intestine. We can also explain the immunity of the peritoneum when this occurs in the mesocolon or vermiform appendix.

It is more difficult to understand the perforation when the foreign body is a shoemaker's awl armed with its thread, as in the following case, reported by Diemerbroëck, who regarded it as witchcraft produced by the action of a demon:

Observation.—"A child, who was playing with an iron awl, swallowed it unwittingly; he complained of abdominal pain, had no fever, and ate as before; the ab-

domen was free. It then became somewhat enlarged, and the child grew more and more emaciated. Diemerbroëck was consulted; he thought at first that the symptoms were due to worms, but the appropriate remedies proved useless. The pains in the abdomen increased to such an extent that it was feared that the cries of the child would give rise to a rupture. The infant's belly was carefully touched, and a solid, pointed object, which almost pierced the skin, was felt underneath the integument, between the umbilicus and the pubis, and a little to the left. It was thought to be a small bone which the child had swallowed. It was decided to make an opening in order to expose the foreign body, and the surgeon was astonished to find the iron of a large shoemaker's awl with a little wax and thread adhering to that portion of the iron which is held in the handle. The awl was promptly withdrawn, and the child then recovered."

As a rule, these foreign bodies do not give rise to very serious symptoms after their exit from the intestine. But we must not generalize too broadly, because the rule laid down by Ollivier, of Angers, with regard to their indifference is not without exceptions. Under this head I will transcribe the following cases:

Observation.—"A woman died, after having been sick twenty-three days with all the symptoms of hectic fever, and after having presented the signs of coagulation in the veins of both lower limbs (phlegmasia alba dolens). At the autopsy a needle was found in the lower part of the vena cava, and around which a thrombus had formed." (Thompson: Brit. Med. Jour., 1874.)

Observation.—"A soldier complained of very severe pain in the hypogastrium; the belly was tense and fever present. A tumor was manifest near the painful spot; the fluctuation which was recognized led to its being opened, and the pus which escaped was fetid and mixed with urine. The patient died, and, upon opening the cadaver, the ureter on the right side was found ulcerated and contained a pin." (Dict. en 30 v., T. 7, Art. Corps Étrangers.)

Observation by Le Tellier.—Fork swallowed; death.—"A woman, æt. 57 years, suffering from suicidal monomania, said that she had swallowed a fork, which was expelled four years later from an abscess in the thigh. The patient died eight days afterward." (Journal des conn. médico-chirurgicales, 1853.)

2. *Formation of a non-phlegmonous tumor.*—We owe this term to Peter, and it deserves to be retained because it sufficiently indicates the pathological process with reference to the foreign bodies. A fissure or perforation is produced at a part of the intestine in which a foreign body or concretion is situated. The body may be situated under the peritoneum or in the cellular tissue, and the perforation of the intestine, which is usually very small, may close again. The foreign body is then free, as it were, and its presence does not give rise, in some cases, to the grave accidents which we shall soon discuss. There is no migration, as in the preceding case, and the phenomena run a somewhat different course. Adhesions form between the various layers of the peritoneum; the walls of the intestines are slightly infiltrated, and the perforating body remains indolent in the midst of tissues which are usually so prone to inflammation.

Among the bodies which have acted in this manner, we may mention: pieces of bone, stalks of barley, needles, a knife. What becomes of these non-phlegmonous tumors? They may remain indolent for a very long time, but it very frequently happens that, after a variable period, they approach the anterior or posterior abdominal wall. A sort of gradual sliding of the foreign body occurs, and always produces around it the same plastic infiltration of the tissues and even adhesions. When the tumor has become superficial, if the artifice to which nature resorts in order to eliminate the foreign body has either ceased, or the tumor is more

easily subjected to external influences, it very often becomes frankly phlegmonous. For example, the exit of a needle through the umbilicus has been observed after the lapse of twenty-three years (Höring). When these collections are opened, a laudable or fetid pus escapes, and there is no issue of stercoraceous matters.

From this time on, the phlegmonous tumors may undergo all the various terminations of inflammatory tumors.

3. *Formation of phlegmonous tumors.*—This termination, after primary perforations or fissures, is much less fortunate than the preceding. A partial, circumscribed peritonitis occurs in such cases, which gives rise to a phlegmon around the foreign body. The striking feature of such cases is the sudden onset and the gravity of the symptoms, which rapidly attain their maximum. Whenever the surgeon is called to a person who is suddenly attacked with violent pains developing in the midst of health, together with vomiting and a small pulse, he should, among other things, think of the possibility of a primary perforation. This question is very well explained to-day, thanks to the labors of Richet, whose ideas are found in the thèses of Peyronnet and Laspale-Mandon (1877). The following observation is transcribed from one of these works:

Observation.—"A very robust police-officer was suddenly seized, as he was about to mount guard, with intestinal derangement, consisting of very severe pain with colic in the abdomen. The man's condition became grave, the belly rapidly became tympanitic, and frequent vomiting spells occurred. At the end of two weeks an abscess formed in the right iliac fossa. Richet declared that the abscess was secondary to an intestinal fissure, basing his opinion upon the peculiar onset and course of the affection. A small piece of bone was found in the pus, which flowed from the artificial opening made in the iliac fossa. The incision was followed by a stercoraceous fistula, which slowly cicatrized. (Peyronnet: Th. Paris, 1876.)

The same author also reports several examples of primary perforations produced by an orange-pit. Nevertheless I believe that this mode of perforation is very rare and that the inflammatory process is much more frequent. Kyle's case is similar to the preceding. In an infant, æt. two years, an abscess formed at the umbilicus, through which a wisp of wheat, three inches long, which had been swallowed two weeks previously, was withdrawn.[1] The pathogeny of the circumscribed tumors is similar to that of all perforations, and I refer the reader to the following chapters.

4. *Peritonitis from primary perforation.*—This is also true of the general peritonitis produced by a wound of the peritoneum during the perforation. It does not differ from traumatic peritonitis, but we may state that it is more frequent when the perforation is primary than when the phlegmonous tumor is circumscribed. This is readily explained by the absence of previous adhesions which are sometimes found after perforations of inflammatory origin.

The following case, reported by Lefeuvre, of Rennes, belongs to this category:

Observation by Lefeuvre.—Mrs. X——, about 40 years old, entered Dr. Briand's service in the Hôtel-Dieu, of Rennes, for a mild affection of the air-passages. After a meal, during which she had eaten fish, the patient was seized with all the symptoms of very acute peritonitis, which terminated fatally at the end of the third day. At the autopsy, pus and plastic exudation were found on the entire peritoneum; but these products were especially abundant in the right iliac fossa, where they entirely covered

[1] J. de méd. et de chir. pratique, 1850, p. 80.

the intestines. The vermiform appendix was bathed in a purulent collection, which was more considerable than the others. It was large and inflamed; a short, but very thick bone traversed it for half its length, remaining engaged by its middle in the perforation which it had produced. This perforation, which was much larger than the bone, had an irregular, gangrenous circumference, and measured about half a centimetre in diameter. (Hallette: Th. de Paris, 1867, T. I.)

6. Inflammatory Complications of Foreign Bodies arrested in the Intestine.—In discussing the phenomenon produced by the temporary arrest of foreign bodies in the intestine, mention has already been made of inflammatory symptoms, such as enteritis and peritonitis, which are usually subacute. It is useless, therefore, to resume this phase of the pathological process which develops primarily in those which are only arrested temporarily, as it does in those which are permanently fixed. But as the lesions become more severe under the influence of the persistent cause, we can understand that they will soon become more profound and give rise to very serious complications. Thus the ulceration, which is slight in the first case, becomes greater and may even involve all the coats of the intestine despite their marked thickening. In fact, all grades exist, from simple congestion or erosion of a Peyer's patch to perforation or gangrene. In the same way the greatest varieties are observed; sometimes the ulceration is situated at the foreign body, sometimes it is situated above it, although it is impossible to determine the reasons for this variation. The usual cause is the continuous pressure exercised by the body upon the wall of the intestine; it causes irritation, ulceration, and mortification. If we add to these exciting causes the effect produced by the formation of pouches, the pathogeny of inflammatory perforations will be readily understood.

Another and almost inevitable consequence of the presence of foreign bodies in the intestine is the formation of adhesions. I have already explained their method of production, and we know that they result from an adhesive peritonitis of the vicinity which unites the layers of the serous membrane to one another. But this is not all. The loops of intestines also take part in the plastic process and adhere to one another at the point at which the intestine is wounded.

I do not think that we can attribute a very great part to the peritoneum in such cases. The other phenomena do not pertain to the peritoneum, but rather to inflammation of the surrounding sub-peritoneal cellular tissue. I apply the term *perienteritis* to this inflammation of the cellular tissue, but some remarks are necessary in order to enable us to understand its signification. Albert, of Bonn, in his work on typhlolithiasis, had arrived at a recognition of the existence of a very peculiar affection, which all physicians admit at the present time, and to which they apply the term perityphlitis. It is an inflammation of the cellular tissue surrounding the vermiform appendix and cæcum. That which Albert described for the appendix vermiformis also exists for every other portion of the intestine adjacent to cellular tissue, and this affection I have called perienteritis. It has nothing in common with peritonitis, being distinguished by its situation, progress, and gravity.

It has been said that circumscribed peritonitis developed in such cases, on account of the previous adhesions which prevented the spread of the inflammation. From a study of the numerous cases reported in literature, I conclude that circumscribed peritonitis is not common in such cases, but that perienteritis is almost the rule. When it assumes the phlegmonous form, it represents what Peter long ago called phlegmonous tumors.

These preliminary considerations were necessary, in order to understand the later developments. This study comprises several complications which result from ulcerous enteritis. They are:

1. Adhesive peritonitis and perienteritis of the vicinity without perforation.
2. Perforation without adhesions. Acute peritonitis.
3. Perforation with adhesions. Acute perienteritis.
4. Perforation with adhesions. Chronic perienteritis.

The majority of these peculiar cases may enter into this class. But they are not always so sharply defined, and may be complicated by one accident or another.

1. *Perienteritis of the vicinity without perforation.*—The inflammatory process which occurs in the intestinal walls may be so severe in some cases that the surrounding or nearest cellular tissue becomes the seat of inflammation. This phenomenon, which is but the confirmation of a pathological law that is verified every day, viz., that the inflammation of an organ may be communicated to adjacent tissues, is especially evident and readily understood with regard to those portions of the intestine in direct contact with the cellular tissue.

The vermiform appendix, as we have already stated, is thus situated, and perienteritis of this region, to which the name abscess of the iliac fossa is usually given, is most frequent. But the termination under consideration, that is to say, perienteritis without perforation, is much less frequent. This propagation, which is so natural with regard to the appendix, is also readily explained for the intestine, if we remember that the effect of the prolonged stay of a foreign body at one point is the production of adhesions which destroy the layers of the serous membrane. When the latter exist, the walls of the intestine are found directly continuous with the most adjacent subperitoneal cellular tissue, and the primary perienteritis without perforation occurs in this case as in the preceding one.

This being assumed, the affection then pursues a very peculiar course which is well established by a large number of observations. Any foreign body—whether large or small, a concretion or ingested object, painful or not, with or without symptoms—gives rise to inflammation around it, with or without ulceration, which is manifested by a very variable array of symptoms. But at a given time the adjacent cellular tissue becomes inflamed, and perienteritis is declared with all the symptoms observed in perityphlitis, viz., high fever, pains in the abdomen, increased upon pressure, constipation, partial tympanitis, which becomes harder at one point. Deep in, we find a diffuse puffiness, which occupies a quarter of the abdomen; anorexia, nausea, sometimes vomiting, more or less serious disorders on the part of the genito-urinary organs, liver, etc. The symptoms due to the neighboring affection also vary, according to the situation of the perienteritis. It may also have different degrees of intensity, and involve a larger or smaller amount of cellular tissue.

The result of this phlegmonous inflammation is a circumscribed abscess, which approaches the walls. It is symptomatized by a diffuse puffiness, with redness of the skin, and by indistinct fluctuation. The fever not unfrequently subsides at this period, and the entire array of other symptoms improves. The abscess may thin the superficial tissues, and make its way to the outside; this is the simplest termination. The spontaneous or artificial opening gives vent to phlegmonous pus of an alliaceous odor, sometimes closes up again, but usually becomes fistulous. In these

cases, we notice, at first, a complete absence of alimentary substances, which shows that the perforation did not exist at the time when the abscess opened. But the pus may follow other paths, may empty into the peritoneum and cause death, or may pass into an adjacent viscus, sometimes even into the intestine. The perforation of the intestine occurs secondarily, and the case then enters one of the other categories; or perhaps it occurs during the formation of the abscess, when the tumor may be temporarily diminished, or be hastened in its course, and even terminate in death.

Finally, absorption of the pus has been noticed in some cases during the course of the affection. I will soon refer to these various terminations. It is sufficient to have described this variety of inflammation, several examples of which are reported by authors.

Observation.—In 1862 Barthez presented to the Medical Society of the Hospitals a grape-seed which had been sufficient to cause the death of a boy fourteen years old, with all the signs of subacute peritonitis, the principal focus of which was situated in the right iliac fossa. The autopsy showed, in addition to the usual signs of peritonitis, that the foreign body, although producing ulceration of the appendix and severe inflammation in the vicinity, had nevertheless not given rise to the perforation. The foreign body was a grape-seed of ordinary size, covered with two superimposed layers, the inner one being composed chiefly of calcium phosphate, and the outer one of nitrogenized organic matters, probably of solid fæcal matter. (Peyronnet: Th. Paris, 1876.)

2. *Perforation without adhesions.—Acute peritonitis.*—After the inflammation by propagation, we observe the perforation produced by ulcerous enteritis. Two cases then present themselves: either the contents of the intestine and the foreign body are found in contact with the peritoneum, or they are separated from it by previously formed adhesions, if they are sufficient to resist the outburst of these substances. The first variety forms the subject of this section.

The perforation being produced, the foreign body and intestinal fluids have a tendency to take this course, and come in contact with the peritoneum or the adhesions which are insufficient to bar their passage. The substances are then extravasated, and a general peritonitis develops, which is fatal in the majority of cases. It is useless to describe these symptoms here. Suffice it to say that its onset is abrupt, but that the individual has, for a long time, suffered all the symptoms produced by the arrest of a foreign body.

Whether the latter is metallic, like a fork, knife, or needle, or of stercoraceous origin, the symptoms develop in the same manner, as the peritoneum does not tolerate the contact with intestinal matters and always reacts very acutely.

The following cases belong to these various categories:

Observation by Babington and Currie (Ann. de litt. méd. étrang., T. II., 1810, p. 501).—"John Cumming, an American sailor, while in a French port, in 1799, went with several of his comrades to see the jugglers, who, among other things, made believe swallowing knives. Shortly afterward he stated, while drunk, that he could do this as well as the jugglers, and really swallowed four closed knives, such as sailors ordinarily use. A few days later these four knives were passed in the stools without much distress.

"Six years later, while in Boston, he was persuaded to repeat this trick, and swallowed fourteen knives of different sizes. The latter, however, made him very sick, but he was cured in the Charlestown Hospital, near Boston, where the knives are preserved.

"Having been captured on an American ship by the English frigate Isis, toward the close of 1805, he entered the British service, and, having vaunted his previous exploits,

he unfortunately allowed himself to be persuaded to satisfy the curiosity of the crew, and swallowed seventeen knives on two successive days He was soon seized with intense pain, nausea, and other alarming symptoms, which demanded the aid of a surgeon, under whose care he remained eighteen months, and was then retired as incapable of service. He entered Guy's Hospital twice in 1807, and was there treated by Dr. Babington, who hardly credited his story, although he produced a letter from his surgeon at Portsmouth, and though his fæces were black, as if he were taking an iron preparation. He was then received by Dr. Currie, in 1808, and remained under his care during the last seven months of his life. He was subjected to pain during this entire period, and gradually emaciated until the end of March, 1809, when he died. Upon opening the cadaver, the entire intestinal canal was found of a black color, as if it had been dipped in ink. The stomach contained fourteen knife-blades and a number of springs, all very much rusted, and the majority almost dissolved, though the name of the cutler could be distinguished on one blade. A copper button and a part of the silver mounting of a knife were hardly at all affected; but the iron mountings and horn handles of the other knives were either dissolved or had been voided. This man had become exceedingly thin, but the immediate cause of his death was the perforation of the intestines by the spring of a large knife, which had passed almost entirely into the abdominal cavity. Two other springs had descended even lower, and were fixed across the pelvis, so that they could be felt upon introducing the finger into the rectum. Although the blades and springs found in the stomach were very rough and pointed, the stomach was not wounded in any part, and, what is more surprising, he endured strong compression on this side without manifesting pain, and sometimes ate with an appetite. We should add that several of these knives, while closed, measured four inches in length, and an inch and three lines in breadth, at the broadest part of the handle and blade."

Peritonitis and intestinal perforation were found in the case of an individual who had swallowed a spoon, and in whom death was the result (Henrion). The spoon was situated in the transverse portion of the duodenum, and the handle, after having pierced the intestine at the point where it curves to become the jejunum, had emerged to the extent of two inches. Internally the duodenum was covered with a thick layer of grayish mucus. The following cases give us an idea of the gravity of these accidents.

Observation.—Feréol observed, in the hospital, a butcher who presented all the spmptoms of peritonitis and severe perityphlitis. The patient died, and, at the autopsy, a perforation was found in the vermiform appendix of the cæcum, the loss of substance being partly closed up by a small rounded body as large as a castor-bean. This body was formed by the union of two or three hairs, which were joined together by a sort of cement composed of fatty matter and calcium phosphate.

Cliquet[1] and others have more recently reported analogous but more common cases. We are less surprised to find that a man, who has swallowed a hundred and twenty cherry-pits and eighty-two leaden bullets, should die of peritonitis.[2]

The relation between the cause and effect is, however, very slight, as the most insignificant bodies may produce death from peritonitis. Briquet reported in the Archives a case of death caused by a melon-seed, which had lodged in the vermiform appendix and perforated it. Although it is not possible to give the exact proportion of cases in which death occurred in this manner, we may, however, say that it is not the most frequent.

3. *Perforation with adhesions.—Acute perienteritis.*—Matters do not run the same course in the second case, in which the perforation occurs at the site of the adhesions. The latter, in fact, modify the process in the most advantageous manner in a large number of cases, since they

[1] Recueil de Mém. de méd. milit., 1878. [2] Dor: Th. de Paris, 1835.

prevent inflammation of the peritoneum. It is useless to repeat that the adhesions develop before, not after the perforation, and result from a phlogistic or plastic peritonitis. These adhesions prevent the extravasation of substances into the peritoneum; but they also act in another and not less effective manner by fixing the intestine to the adjacent loops and to the abdominal walls. This immobilization is extremely useful, because it enables the intestine to resist the functional tractions which may overcome slight adhesions.

Moreover, surgical practice imitates nature, and we may attribute part of the success obtained by cuirasses of collodion to this immobilization.

Such is the condition of the parts at the time when the perienteritis develops, the latter being produced by the contact of the intestinal contents or of the foreign body with the tissue of the adhesions, which are eminently adapted to propagate inflammation. This contact produces a revolution in the economy. Suddenly, without any marked prodromata, the patients are seized with violent pains, as in cases of subacute peritonitis. Nausea and vomiting supervene; the face changes; the temperature is lowered. This is the onset of acute perienteritis. Pressure upon the abdomen increases the suffering, and the physician, struck by the intensity of these symptoms, will look in vain for their cause, if the history does not indicate it. Meteorism develops, but no tumor forms; radiating pains. After a lapse of time, varying from twelve to twenty-eight hours, the scene changes. The low temperature is followed by marked fever, with nocturnal exacerbations. The vomiting ceases, and obstinate constipation occurs; very rarely there is diarrhœa; insomnia, anorexia, sometimes delirium. It is only after the lapse of forty-eight hours that we can outline a tumor in some part of the abdomen. At first diffused, it becomes fluctuating, appears to approach the skin, and becomes more and more circumscribed. At this period the only question refers to the most frequent termination of acute perienteritis, as affairs turn out somewhat differently according to the site of the affection. Acute or phlegmonous perienteritis runs its course in six or eight days, and terminates by the formation of an abscess which projects at some excentric point.

After it has once collected, the pus tends to empty externally, but it sometimes happens that the adhesions prevent it, and fatal peritonitis then results. Joffroy has published a very curious case of this kind, produced by a pin, the head of which had perforated the vermiform appendix.

What is the condition of the foreign bodies after the perforation occurs? The observation of cases enables us, up to a certain point, to answer this question, which is still very poorly understood by surgeons. When the abscesses, produced by perienteritis, open or are opened: 1st, the pus alone is either discharged in very large quantity; 2d, or pus with fæcal matter (in variable quantity for a very short time) as well as the foreign body; 3d, or there is an artificial anus.

How can we explain the first case in which pus alone escapes? And, first, why does the pus collect in such a manner as to open outward and not into the perforated intestine? By what mechanism does it form? We will not receive much aid in the solution of this question by consulting the most recent works. All insist upon the production of adhesions, and what is properly termed circumscribed peritonitis, and upon the favorable development of an abscess through which the foreign body may make its exit sooner or later. We must examine the facts very closely in order to explain the differences in the nature of the discharged sub-

stances and in the condition of the foreign body. One fact is known to science, viz., that the foreign body, when its shape and size are favorable, may completely obstruct the perforation without passing through it. Calculi and stercoraceous concretions very often act in this manner, prevent the penetration of fæcal matters, and remain in the intestine or in the diverticulum which they occupy. During this time the perienteritis will produce pus, and an abscess will open and terminate in a fistula. Cases have been seen in which the fistula following acute perienteritis has lasted a very long time, although the body had not emerged from the intestine. There is also another way of explaining the escape of pus without other substances, viz., to admit, as is very plausible, that the perienteritis produced in the vicinity alone progresses, being separated from the perforation by adhesions. The communication caused by pressure does not occur until late, and will explain the sudden escape of fæcal matter and pus which is observed in some cases. But we can understand that they are very difficult to explain in a precise manner, because the cases vary infinitely, and require very delicate observation.

But if we examine the phenomena which are produced when the opening of the abscess gives vent, for some time, to a certain quantity of intestinal contents mixed with pus, as well as to the foreign body, the uncertainty increases. We must admit that the perforation causes extravasation into the adhesions, and inflammation of the peri-intestinal cellular tissue, and that during this time the perforation becomes obliterated in some manner, either by granulation of the edges or by cicatrization. How else can we explain the fact that the escape of substances ceases very shortly after the opening of the abscess, and sometimes immediately? The perforation is produced first, the perienteritis follows. But this is rare in cases of acute perienteritis, because the process usually proceeds too quickly to permit cicatrization of the intestinal lesions.

The most frequent termination in such cases is the formation of an artificial anus, which usually forms very soon after the opening of the phlegmon. The intestinal matters are at first solid; then they become more fluid, and arrive in larger quantities according as the perforation increases. The anus opens into a larger or smaller intermediate cavity, which serves as a receptacle, and the presence of which greatly clouds the prognosis and renders the surgeon doubtful with regard to the practice to be pursued. The foreign body becomes gradually engaged according to its shape and size. It may be retained at the bottom of the cavity for a long time, or be promptly discharged; hence there are great variations in the duration of the disease. It is also difficult to give the exact time which the process occupies in all its various stages. It is always more than eight days, and recovery may be delayed for a very long time, because the abscess sometimes degenerates into a fistula. When the artificial anus is established, two events may come to pass: 1st, the anus may persist indefinitely; 2d, it may gradually diminish, and recovery then occurs.

We will also remark that the nature of the discharge varies according to the site of the affection, that it is more liquid, yellowish, and less fetid in the first part of the small intestine, and browner and more stercoraceous in the lower parts. No one will fail to recognize the usefulness of these indications.

I will now quote some interesting cases of phlegmonous perienteritis:

Observation.—Expulsion of a fork from an ab cess in the groin (Charpy: Gaz. méd., 1874).—A woman, fifty-six years of age, and suffering from hypochondria and melan-

cholia, endeavored to kill herself by swallowing a fork. She related the fact a few days later, but it was disbelieved. Upon examining the abdomen, a hard and slightly painful tumor was found in the right iliac fossa, which was regarded as a fibrous body, and supposed to be the cause of her illusion. Little by little the tumor increased in size, and became adherent to the abdominal walls, the skin becoming red and tender. An abscess formed, and twenty days after its ingestion the fork made its exit, with the teeth in front, through an elongated opening about four centimetres in length. The fork had become black. For fifty-five days a clear fluid, containing rice-like grains, which were found to be alimentary debris, issued from the opening; the wound then closed.

Observation by Richet and Bouchut (Th. Peyronnet, 1876; Refroigney, 1873).—*Intestinal perforation by a foreign body.—Abscess in the iliac fossa.—Fæcal fistula.—Drainage of the peritoneum.—Recovery.*—M. X., forty-two years old, and usually in good health, tells us that, after having been confined without any suffering, she was taken during sleep with an extremely intense pain in the right iliac fossa, which compelled her to get out of bed and walk around, half bent over. The skin could not be touched; the abdomen was tense, tympanitic, and very painful. Leeches relieved the pain slightly, but the abdomen increased in size. At the end of three days an enormous, very painful fluctuating tumor was felt in the right iliac fossa and under the pubis. The patient's face had sunken in, the eyes were hollow, the skin hot and fever high. She vomited at times, and could only obtain a passage after enemata. On account of this fluctuating tumor, Richet was called in consultation, and our opinion being that perforation of the vermiform appendix had occurred, with partial peritonitis giving rise to the previously mentioned fluctuating tumor, we performed aspiration with Dieulafoy's apparatus and canula No. 2. It withdrew a large quantity of puriform, dirty, fetid fluid. After the tumor was emptied, the patient experienced great relief; but during the day the fluid was entirely reproduced, causing the tumor to again appear, and the production of fluid was so great that it pushed the intestines and diaphragm up to such an extent as to cause a fear of asphyxia. I again called in Dr. Richet, and we decided to pass a drainage-tube into the tumor in order to obtain a continuous discharge. The operation was performed forthwith; the incision was followed by the discharge of a large quantity of sanious purulent fluid, which was so fetid that the staircase and apartment in the hotel were infected with it. Richet found in this pus an orange-seed, which passed out at the moment in which the incision was made. One per cent. solution of carbolic acid was injected into the pouch several times daily, and fluid, sometimes with alimentary detritus and numerous drops of fat, escaped through the drainage-tube. At the same time, in order to relieve the general condition, which was serious, we ordered champagne, Bordeaux wine, brandy, and raw meat.

This treatment was maintained for three months, and was followed by complete recovery after some slight complications. The patient, whom I have since seen, is in perfect health. (Bouchut.)

Observations of this kind are so frequent at the present time, that it is useless to report them. They all resemble the preceding one, differing only as regards the termination, which is sometimes fatal, and sometimes very prolonged. According to Fideli, an iron fork, which had remained for two years in the digestive canal of a woman fifty years old, was withdrawn from an abscess in the hypochondrium.

4. *Perforation with adhesions.—Chronic perienteritis.*—The latter variety, more frequent than the preceding, assumes a somewhat different form, being much slower. The enteritis and perforation are present as before, as well as the peritoneal adhesions. But the peculiarity consists in the slight general effect produced by the perforation, which is not characterized by an abrupt beginning, as in cases of phlegmonous perienteritis.

Laspale-Mandon terms it *silent perforation*, and this expression is justified by experience. Nothing in the previous history or actual symptoms justifies a suspicion of such an important process and of the imminence of such a serious danger. The appearance of a tumor in some part of the abdomen is often the first thing to attract the attention of the pa-

tient. Nevertheless, if the previous history indicates the presence of a foreign body, we must bear this termination in mind, and inquire whether it is possible from the condition of the adjacent parts. We may also notice a small, firm tumor, which is but slightly painful; this is a deep induration rather than a true tumor.

But the symptoms do not always run their course in the midst of such great tolerance; pains may be present, which irradiate into the limbs, attract the attention of the surgeon for a long time and enable him to discover the tumor. The functional symptoms are often not well marked, being restricted to alternations of diarrhœa and constipation, usually to the latter. The presence of pus has been noticed in some of these cases.

What occurs during this time at the site of the perforation? The foreign body engages in the perforation, but the substances are usually not extravasated. The adhesions increase, and the interstitial cellular tissue is indurated over a variable space. Hence the formation of the indolent tumor which we notice. The condition of affairs may remain stationary for a very long time without any general reaction. But from a traumatism, a shock, or during some other disease, the adhesions are torn, and an acute peritonitis carries off the patient. Such instances are infrequent when compared with cases of purulent deposit or chronic perienteritis. The tumor gradually increases in size, becomes more superficial, and the foreign body passes partially or wholly into the tumor. At the same time the inflammatory phenomena increase, and are characterized by redness of the skin, fever, the formation of a tumor, and functional symptoms. Fluctuation becomes evident and the abscess opens, unless surgical interference anticipates nature. The discharged pus is sometimes frankly phlegmonous, but usually fetid, of an alliaceous odor, reddish color, and containing particles of alimentary substances. On the following days these matters continue to be discharged, and an artificial anus thus exists. The fate of the foreign body is extremely variable. Sometimes it presents itself at the opening, sometimes remains enclosed in the midst of deep adhesions. Its presence is generally revealed to the surgeon after a few explorations, and the indication is to withdraw it, if possible. In place of a single orifice, several may be present, indicating the formation of several circumscribed collections.

But the symptoms do not always run this course, and, when the abscess is opened, the intestinal contents may not be discharged, and the foreign body may not present itself. How can we explain this peculiarity? Must we not admit that the foreign body has, after the perforation, become encysted in the tissue of the adhesions, that the intestinal opening has cicatrized after its exit, and that the abscess has only formed during a second period of development? Science presents several examples which justify this view and which are not peculiar to the intestines. We find foreign bodies expelled from an abscess, although an artificial anus never existed. The restoration of the usual course of the intestinal contents renders this process more comprehensible.

But this is not the only explanation of this fact; there is another, which has been also observed by excellent authors, and which consists in the incomplete passage of the foreign body from the intestine or one of its diverticula into the tissue of the adhesions. The extravasation of substances is rendered impossible, because the concretions permanently obstruct the orifice, and the formation of a fistula is the inevitable consequence of the phlegmon.

The following case, reported by Peter, is a very good example:

Observation (*epitomized*).—A pin, inadvertently swallowed, passed through the vermiform appendix, and then through the abdominal walls, where it gave rise to the production of a tumor and later of an abscess. Protecting adhesions were formed, which prevented the extravasation of fæcal matter into the peritoneum; the appendix only allowing a narrow passage to the fæces, they were slowly deposited around the pin, became solidified in the form of a concentric cylinder around it, and at a later period, when the tumor had undergone abscess formation, effectually prevented the production of an artificial anus.

I now return to the usual termination, viz., the formation of a stercoraceous abscess containing the foreign body. When the collection is emptied, the artificial anus may exist, but more rarely than we would be led to believe at first sight. At all events it rarely persists for a very long time, and may terminate rapidly as soon as the obstruction has disappeared, and the corresponding portion of the intestine has resumed its functions, an event which occurs rapidly in the majority of cases.

What is the site of "election" of the perienteritis? *A priori* we should expect to find the cæcal portion, which is the site of election in the arrest of foreign bodies, also become the most frequent situation of chronic perienteritis, which in this situation is known as perityphlitis. These tumors are most frequently observed in the right hypochondrium, and constitute a very large proportion of the total number of cases observed.

However, this fact being established, we must state that perienteritis may be observed in all other regions, and, in the order of frequency, we must place the umbilicus first, then the left iliac fossa, and, finally, the lumbar region. It has been stated that umbilical phlegmons due to foreign bodies are caused by the arrest of the latter in the transverse colon, but the proximity of other loops of small intestine is not indifferent. Grains of barley, cherry-pits, etc., are expelled by this path. Deep perienteritis, giving rise to a phlegmon in the lumbar region, is very rare, but authentic examples are on record. Thus a fork has been withdrawn from an abscess in the loins, and, in other cases, a knife and a fish-bone. Bartholin reports that three sharp pieces of iron, which had been swallowed, issued six months later from the posterior part of the belly.

Hitherto we have only discussed perienteritis terminating in a superficial phlegmon, but we know that matters do not always end in this manner, and that the position of a foreign body may produce an inflammation of the tissue situated between the intestine and another viscus. The genesis of these collections is readily understood. The simplest case is that in which an adhesion is formed between the two organs, and in which the perforation occurs insensibly and quietly, without the formation of pus, under the influence of weight and the pressure of the foreign body. Thus patients have found that the foreign bodies were passed through the urinary passages, although they had not noticed the first stage of the perforation. Hévin's treatise reports several cases of this character.

Chopart[1] devotes a chapter to the study of foreign bodies which have either been swallowed or were contained in the intestine, and which passed into the bladder. But we should put no faith in the cases reported by Diemerbroëck, Langius, etc., in which ingested needles were passed by the urethra three days later. The following observation by Stalpart Van der Viel is more probable:

Observation.—A boy, seven or eight years old, while playing, swallowed a pin two fingers' breadth in length. At the end of several years the boy experienced pains in

[1] Traité des maladies des voies urinaires, T. II., p. 129.

the region of the kidneys and bladder. After taking thermal waters, he passed gravel through the urethra, together with some small live worms, and a fetid, blackish substance. He finally had difficulty in micturition, followed by retention of urine. After great efforts to urinate, he felt the point of the pin at the end of the glans and in the meatus urinarius, and extracted it. The pin was incrusted chiefly in the middle, with a grayish calculous substance, which was so thick as to have the form of an olive-pit. (Obs. sur cent., 2 obs., 18, p. 204, and Mémoire d'Hévin.)

In other and even more astonishing cases, the needles had followed this path and had passed out with the urine three days after their ingestion. Bartholin has seen a plum-pit produce symptoms of retention, simulate renal colic, and pass out through the urethra on the forty-fourth day. There was a very abundant excretion of urine at the same time.

According to Chopart[1] the post-mortem examination has, on several occasions, revealed the fistulous opening through which the foreign body passed from the intestines into the bladder. A man passed some grape-seeds, pieces of lettuce, and other alimentary substances, with the urine. After death the bladder was found ulcerated and perforated. (Bonnet: Sépul., Lib. 6, Sect. 28, Obs. 30.)

Morgagni saw an analogous case. He thought that a part of the ilium became inflamed, formed adhesions with the bladder, and that ulceration then occurred, and a communication between the viscera.

Not only the bladder may be the seat of these perforations, but they have also been observed in the ureter.

Observation.—A man, æt. 30 years, entered the Pitié Hospital for a considerable stricture of the rectum, from which he died. Upon opening the cadaver, we found in the pelvis a sub-peritoneal induration which almost entirely closed the rectum. A purulent track extended from the rectum almost as far as the liver. A calculus, about an inch large, having a pin as a nucleus, was present between the ureter and ascending colon, two inches below the kidney. The pin was situated in such a manner that the head still projected into the intestine, while the point was found in the ureter. (Velpeau: Méd. opératoire, T. 3, p. 236.)

A biliary calculus has also been known to be passed in the urine. Hévin also makes mention of a peach-pit which had perforated the intestine and bladder, and made its exit through the urethral canal, an event less comprehensible. I give the fact as Hévin reports it, without vouching for it, and restrict myself to pleading extenuating circumstances, by remarking that the stone may have been very small, and the urethral canal very large. Concretions may also force their way into the bladder. Illustrations are not very infrequent, and Richet has mentioned several examples in his practice.

Where does the perforation occur? The surgeons of the last century were not in accord on this question, and it has not been settled since. Some believe, with Claudinus, that the small intestine had intimate connections with the wall of the bladder, which will explain the passage. Some, Hévin among others, believe that the perforation occurs between the rectum and bladder. I think that the question will remain undecided for a long time, until nature is interrogated concerning the question in autopsies; but there is nothing opposed to the view that the perforation causes a communication between the small intestine and ureter, the rectum and the bladder. It remains to separate those belonging to one or the other, but this cannot be done in actual practice. We should, in such cases, examine the nature of the substances, and their degree of digestion,

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[1] Loc. cit., T. II., p. 134.

and reason by exclusion. Finally, we can compare the preceding cases with those in which the perforation occurs from one part of the intestine to another. This mode of formation of the perforation is rare, and we hardly know any other illustration than that of P. Dubois' case, in which a metallic foreign body was thus passed from the stomach into the colon. In this event the ulcerative process may remain unnoticed, and this method of termination is a very lucky one.

Fistulæ.—Properly speaking, the termination in fistulæ is only the consequence of the various preceding processes; but in the present case they assume such special forms and are so frequent, that it will be useful to study them separately. They always develop from an abscess, especially when the foreign body is not free in the phlegmonous cavity. If, for various reasons, the foreign body does not leave the intestine, or if it is retained in the midst of adhesions, the suppuration will continue, and the abscess will be transformed into a fistulæ. In order that this process shall be accomplished, a certain number of modifications must occur in the constitution of the abscess. The cloaca diminishes, either from granulation or constriction of the walls, as the peritoneal adhesions are very retractile, like elastic tissue.

The cavity of the abscess is therefore transformed into a more or less sinuous canal, usually very narrow, which leads down to the foreign body. In place of a single orifice, a larger number is sometimes observed, and even as many as five or six. As soon as the fistula is established, the character of the pus changes. It is no longer frankly phlegmonous, but very often serous, with occasional returns to its previous condition.

The fistula presents a canal and two extremities for consideration. The external opening is usually depressed, very narrow, sometimes provided with a "hen's anus" projection, formed by granulations. The tissues around it are hard and œdematous, and the irritated skin is usually red. There is no orifice at the other end of the fistula, except in cases of artificial anus, which do not concern us at present; it forms a cul-de-sac, which is usually very small, and in which is found the entire foreign body, or that part which projects outside of the intestine. This is the condition of the ends of the sinus. How is the canal formed? It is composed almost entirely of fibrous and of indurated cellular tissue. Whenever these fistulæ have been observed, the tissue has been found waxy, and the adhesions, which bind the intestine to one or several portions of the adjacent wall, are very thick and firm. The interior of the canal is lined with granulations. Preservative peritoneal adhesions are found outside of the fibrous tissue of new formation, which has been produced by suppuration.

Such is the construction of the abdominal fistulæ, which are so frequent after phlegmons produced by foreign bodies. They develop slowly, and this fact alone suffices to explain the slowness of cicatrization. Even when the foreign body has been expelled or extracted, the fistula cicatrizes with great difficulty, sometimes never, if it is very old, because the fibrous tissue composing it has no tendency to degeneration. At other times, cicatrization occurs, but only lasts for a certain length of time, with very frequent relapses, which produce successive abscesses, followed by reproduction of the fistula.

The hyperplasia of connective tissue is not always confined to the fistulous region, and may extend to a considerable distance. Thus the induration has been known to affect the inguinal glands in a case of fistula of the right iliac fossa.

Finally, these fistulæ may be the source of very grave symptoms. In addition to the infections which this opening may admit into the economy, there are dangers inherent in the fistula itself and in the foreign body which produced it, viz., rupture of the adjacent adhesions. An irregular foreign body, after a spontaneous movement or one communicated to it by the surgeon, may break the tissues surrounding it and the adhesions which guard the peritoneum. It is hardly necessary to say that death is the inevitable consequence of such a lesion. This peculiarity should not be forgotten by the surgeon when he proposes to interfere in order to extract a foreign body situated at the bottom of an abdominal fistula. It is a matter of life and death whether he decides for active or slow interference.

CHAPTER V.

DIAGNOSIS.

No one will fail to recognize the importance of the diagnosis, after the preceding study of the course and symptoms of foreign bodies. Unfortunately it is either very easy or very difficult, according as the previous history does or does not furnish the surgeon with useful data. On the other hand, it very often happens that the surgeon is not consulted until a period in the affection in which the primary cause can no longer be discovered, on account of the serious complications which have developed. When, for example, a foreign body formed in the intestine ulcerates an organ and produces a perforation with peritonitis, the onset is so sudden, the previous history so slight, and the symptoms so grave, that the physician is very much embarrassed. We must therefore determine whether we can suspect the cause of disease with any chance of success. When a previous history can be obtained, it is very precious in all cases of ingested foreign bodies, because it guides the surgeon in his investigations, and enables him to properly interpret the phenomena which he observes, and to determine the situation and chances of passage of the foreign body. He must therefore always inquire into the history, either of the patient himself or of those in attendance; he must ask whether they have not had hernia or any previous affections which would predispose to the arrest of foreign bodies.

In lunatic asylums no notice is sometimes paid to the statements of patients who have swallowed bodies even as large as a fork. In such cases it is wrong to be too skeptical. But, even when objects have been swallowed, and much more so when they have formed in the intestine, such as stercoraceous tumors, the history is often wanting, unless the physician obtains one by a series of questions made for the purpose of obtaining information with regard to functional disturbances. If, for example, an individual presents himself with symptoms of obstruction or strangulation (which are identical), the data obtained by questioning the patient will sometimes settle the diagnosis between ileus and a concretion. We should, also, always ask them whether they have been in the habit of swallowing cherry, plum, and date pits, even if these fruits are not in season.

Habitual constipation, or alternations of diarrhœa and constipation, with predominance of the latter, and abdominal tympanites, constitute useful signs, which will lead us to suspect the nature of the affection and the source of the symptoms present. But this is attended with great difficulty, because we can only arrive at a diagnosis by exclusion, by throwing out other affections, and by feeling our way at each step.

Pain may also furnish valuable indications, though in itself it presents no peculiarity. Colic would not indicate an obstruction to the progress of alimentary substances, if the history were wanting; it is so slightly characteristic, that, in a certain number of cases, it was thought to be due to nephritic colic, and the treatment appropriate to the latter was adopted. In the same way the convulsions or suffering which force the patient to roll on the floor, present nothing characteristic. They merely indicate, by their intensity, the imminence of a serious danger. But, in the majority of cases, the fixity of the pain is quite different with regard to the precise diagnosis of the affected region. When it is not too extensive it leads the surgeon, in fact, to a knowledge of its cause, and even of the situation of the foreign body. Suppose a patient, who is habitually constipated, suffers from pain in the right hypochondrium. In such a case we should carefully explore the iliac fossa, because these two subjective and functional symptoms are indicative of an arrest in the course of the intestines.

I have previously expressed my opinion concerning Laugier's theory on partial or total tympanites of the abdomen, according to the situation of the foreign body. This is a very uncertain guide in the majority of cases. The same may also be said of Barlow's sign, based on the quantity of urine excreted. According to him, an obstruction situated near the pylorus produces a diminution in the quantity of urine, while there is a much larger proportion in a cæcal obstruction. This very theoretical method of investigation is based on the laws of absorption.

The objective signs furnished by an examination of the patient, and of the region affected, are very valuable in a large number of cases. Inspection rarely furnishes useful indications, except under some circumstances in which the foreign body projects underneath the skin, as in Diemerbroëck's case, in which a sharp awl raised up the skin of the umbilical region. The authors of the Compendium mention a case in which a hernial loop of intestines produced a jingling noise due to an accumulation of cherry-pits.

Palpation is very useful and indispensable. In order to perform it properly, the abdominal walls should he relaxed as much as the condition of the patients will permit. This being done, the abdomen is explored with the tips of the fingers carefully pressed in, and directed toward the region in which the pain is felt.

Pressure often produces pain at a fixed point at which the hand perceives a hard body. Every new examination produces the same suffering, which is sometimes intolerable, and indicates to the surgeon the exact position of the body. If a tumor exists at this point, we should investigate its nature, and determine whether it is fluctuating or not, regular or irregular, movable or fixed. Finally, if the pain is not very acute, we may cautiously determine whether the tumor retains the impression of the finger. All these examinations possess the greatest importance, because they enable us to discover the situation of the tumor, whether it is inflammatory, cystic, formed by a concretion or a mass of fæces, and whether it can be compressed under the finger.

Examination of the genito-urinary organs may serve to exclude the chances of error. We have seen most disastrous measures of interference follow mistakes in diagnosis.

Ruty[1] reports that a man was cut for a stone which did not exist. The patient died, and at the autopsy it was found that what had been mistaken for a calculus was merely a concretion in the cæcum formed of hardened excrement.

Percussion may also be of service in diagnosis. Among other cases, this measure served Gosselin in recognizing the situation and following the course of a clay pipe. However, I think its use is very restricted. When the foreign body is situated deep in the iliac fossa, percussion becomes deceptive if meteorism is at all developed.

These are the signs which enable us to make a diagnosis. They present nothing specific, as we have seen, and they must all be united, in order to afford grounds for suspecting the presence of a foreign body. As soon as the idea strikes us, we must pass all the signs in review, and when we observe the symptoms or complications which have been described above, we must think of the possibility of an ingested foreign body or of a concretion.

Despite this, there are many insurmountable difficulties in practice. At all events, we must not interfere hastily, as in the case mentioned above.

A recital of the numerous errors of the ablest surgeons is the best means of showing what is required in diagnosis, its difficulties, and the necessity of extreme caution. Concretions have been mistaken for enlargement of the mesenteric glands, for new growths, scirrhus. Furthermore, they have been mistaken for nephritis and abscess. A shoemaker's awl imposed upon an able surgeon, and led him to diagnose the presence of ascarides, against which vermifuges failed. This fact occurs very often with regard to other foreign bodies, and the attention of the relatives is attracted by the picking of the nose observed in such cases. Nélaton reports[2] that a diagnosis of ascites and heart disease was made in a certain eminent person; one day he had two fæcal evacuations, and was completely relieved. The coincidence of hernia sometimes deceives the surgeon, who thinks that he has to deal with a case of strangulated hernia, because all the signs of an internal obstruction are present. It was only at the very moment when he had taken the bistoury in his hand that Lisfranc had the good fortune to discover his mistake.

Finally, what is to be done when we are called to relieve some complication? If the symptoms of obstruction or perienteritis are present, we must investigate the course of the affection, and carefully examine the stools and vomited matters, if there are any. If a tumor forms secondarily to functional disturbances in digestion, and projects at some part of the abdomen, we should suspect a foreign body. The presence of a hard body at the bottom of a fistula renders this certain. But we should use great care in making such an exploration, and should only employ soft instruments, preferably a rubber catheter with a metallic mandrel.

Before closing the chapter on diagnosis, I think it will be useful to give some indications which will enable us to discover whether the obstruction is situated in the large or small intestine, and to differentiate acute obstruction or strangulation and ileus.

In the first place, there is a marked difference in the antecedents. In

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[1] Traité de voies urinaires, p. 25. [2] Rouyer: Gaz. méd., 1862.

fact, volvulus and ileus appear suddenly, in the midst of perfect health, while the obstruction, when due to a foreign body, whatever its situation, is always preceded by vague pains or slight attacks of incomplete obstruction. The pain is therefore much more acute in the first case than in the second, in which it increases progressively, according as the partial or total distention increases. At this time the general condition is very much affected in ileus and volvulus, while the patient, suffering from obstruction, preserves his mental faculties during the entire course of the affection. In the same manner the vomiting in mechanical obstruction appears later, is intermittent, bilious for a longer time, and does not become fæculent until the end, especially if the obstacle is situated in the large intestine. In all cases the constipation presents almost the same intensity, being greater as the meteorism is more marked, and not presenting any remissions, except in cases of chronic obstruction of the small intestine. Palpation may also distinguish the affections. In obstruction the abdomen is hard and doughy, especially in the fossæ, in which we may detect a deep, resisting, and sometimes compressible tumor. The rectum is empty, and the urine normal in quantity, while it is suppressed in volvulus.

These are the chief signs which serve the surgeon in the differential diagnosis of obstruction. They are only useful when taken together, but, in the absence of better indications, render great service.

CHAPTER VI.

PROGNOSIS.

In a general way the prognosis of these foreign bodies is not grave; Mignon gives the mortality as 7.36 per cent. Without attaching any importance to this figure, it proves at least that the number of deaths reported by authors is very small. Perhaps it would be larger if we added the numerous cases in which the diagnosis has not been made during life, and in which stercoraceous tumors or concretions, fruit-stones, etc., were found, the patient having presented all the symptoms of obstruction. I myself have observed several cases of this kind during the last ten years.

However, we must acknowledge that the prognosis is very good, especially in foreign bodies of moderate size. Thus we very rarely find accidents caused by coins. But it is very much aggravated when the size of the foreign body is excessive (forks, knives, enteroliths), or if it is very small and is arrested in a diverticulum. Bodies situated in the cæcal appendix present an exceptional gravity, which is due to the fact that they may be incrusted with hard or calcareous matters, may enlarge in situ, form external adhesions, and lead to grave complications. The reader no doubt remembers that a grape-seed has, in such cases, been the cause of death. If the arrested body is sharp, the prognosis is less serious. It becomes, on the other hand, more serious if the arrested body is situated higher, if there are persistent and exacerbating pains, vomiting, constipation, meteorism, etc.

The duration of their stay is an important element, which has not been sufficiently taken into account; fatal marasmus and weakness sometimes result from it.

Phlegmonous tumors are more serious than the non-phlegmonous. Fistulæ are even more dangerous, as much on account of the adhesions which they produce as of the fatal accidents which their rupture may cause.

Death may occur in the following ways:

1. By the marasmus produced by the arrest of the foreign body in the intestine. Its presence always gives rise to continuous disturbances of digestion, which in the long run produce cachexia and emaciation. But it is also due to the intestinal ulcerations which affect the mucous membrane and produce purulent diarrhœa.

2. By marasmus after expulsion. The causes are the same as in the previous case, but the foreign body is expelled spontaneously. Nature, whose vitality is destroyed by previous disorders, cannot repair the disorganization produced and does not secure recovery. This happened in Gosselin's and Corbett's cases. Bayle[1] also reports the case of a woman who swallowed some pins, and had dysenteric discharges, colic, and frequent convulsions. She died at the end of five weeks, although the pins were passed through different parts of the abdomen and in the evacuations. I quote this example among a large number of others.

3. Death from intestinal obstruction, which is especially observed in cases of concretions and stercoraceous tumors.

Observation.—Death by an incrusted body in the cœcum.—Joubert de Lamotte reports that at the autopsy of a man, who died of tympanites, the cæcum, which was very large, was found to contain whole cherries of a deep black color. A body as hard as a rock, of the size of a large orange, and which very much resembled a potato, was also extracted. It weighed four ounces; its color externally was brown; its substance resembled that of very fine, well-pressed wadding; the color internally was almost like that of a sponge. It appeared to be very compact, like touch-wood. (Jour. gén. de méd., T. XXIV., p. 67, 1766.)

4. Death from peritonitis, secondary to perforation of the intestine without adhesions, or to rupture of these adhesions during the course of a perienteritis; finally, to rupture of a fistula.

CHAPTER VII.

TREATMENT.

The treatment of foreign bodies of the intestine includes three parts:

1. Prophylactic treatment.
2. Curative treatment.
3. Treatment of complications.

1. Prophylactic Treatment.—Ingested foreign bodies are not included in this group, because the physician cannot diminish their frequency. But this is not true of bodies formed entirely in the intestines,

[1] Nouvelles de la république des lettres, Octobre, 1685.

as advice may obviate disastrous symptoms, and, at all events, prevent relapses.

Prophylactic treatment does not, therefore, apply to concretions, calculi, and stercoraceous tumors. We know that they proceed from some accidental or acquired disposition of the intestine, either physical or functional. The physician must also resort to this order of ideas in advising prophylactic measures in those who are predisposed to these affections. If a person is usually constipated and suffers from meteorism, pain, etc., it is wise not to allow the economy to become habituated to this condition, and we should advise that the intestines be emptied, either by medicinal treatment or by enemata. Thus, in countries in which the inhabitants are predisposed to the formation of concretions on account of the use of oatmeal, we must, as far as possible, forbid its use by those individuals who have infrequent and difficult evacuations. In a general way, we must make the same recommendations to all persons who are predisposed, either by some disease or infirmity, to torpidity of the bowels.

I do not insist upon these measures, which belong to popular hygiene. We can say nothing definite with regard to the ingestion of fruit-stones, kernels, etc., because they are often swallowed unwittingly, and because the accidents to which they give rise are very rare if we consider the large number of individuals thus exposed.

2. Curative Treatment.—The further removed the body is from the end of the intestinal canal, the more the surgeon's resources diminish; and when the body is situated in the intestines, the expectant plan is the rule, from which we must not depart except in a small number of exceptional cases. There are also other reasons which militate in its favor. Is it not preferable to allow nature to act, since, in the majority of cases, she is able unaided to expel the foreign body? On the other hand, interference, in the present condition of science, is more serious than the disease itself.

But though the physician finds himself disarmed, his action is none the less very useful, because it may aid nature in her work, hasten the passage, and diminish the irregularities of the foreign bodies, and arrest the deposit of new layers upon the concretions already formed.

Two cases present themselves.

1. The ingested foreign body is irregular and large.

2. It is regular or formed in the intestine (concretions, stercoraceous tumors). The treatment varies in the two cases.

1. *Irregular ingested foreign bodies.*—The precepts applicable to them are almost the same as those which have been described in speaking of foreign bodies in the stomach. The object of all of them is to enclose the foreign body in the alimentary substances in such a manner as to facilitate its progress, and to diminish the extent of the projections which may wound the intestine. Rest and abstinence from all fatiguing work, such as walking, must be strongly insisted upon. The patient should lie down, varying his position according to his own convenience; he will assume that which best relieves the pain.

The practice, with regard to nourishment, has been to give fæculent food without diluting it much with copious drinks. Bauchet[1] reports that a pin, which had been swallowed by a man, was enclosed in a piece of brown cole which had been given the patient to eat. Portal used the

[1] Bull. Soc. anat., 1855.

same measure in a case of poisoning with pounded glass. Others have resorted to the use of fatty food, butter, for example, and even oil. These substances, by lubricating the foreign body, favor its migration and also protect the inner surface of the intestine.

If the passage is effected with too much pain, we should always apply ointments of opium or belladonna to the abdomen, or administer a hypodermic injection.

The intervention of the physician should be restricted to this when the phenomena pursue their regular course. If there are periods of arrest or very long intermissions in the passages, as we will be able to determine by the ensemble of symptoms, it is then advisable to avoid the accumulation of substances above the foreign body by employing the proper treatment for stercoraceous tumors, viz., very mild laxatives. In addition, the surgeon should hold himself in readiness to face all the accidents which may complicate the situation.

Expectation is then the wisest plan when the foreign body is permanently arrested at one point. There is no indication for interference, inasmuch as the general health would be too strongly implicated, and life would be threatened. But we must not hesitate to search for the foreign body by enterotomy, if all other means have failed.

2. *Treatment of concretions and stercoraceous tumors.*—But the surgeon's practice should be entirely different if he has diagnosed a stercoraceous tumor or concretion. Not only is it no longer advisable to administer gross, fæculent substances, and fatty articles, but he must, on the contrary, prevent the hardening and thickening of the fæces by the administration of laxatives and sedatives.

In this manner he will effectually oppose the increase of the tumors, and will even favor their division or expulsion. Saline purgatives, the use of magnesia mineral waters, a vegetable diet, with few fæculent articles, are very useful in such cases. But he must insist upon the use of purgatives which gradually move the stony mass, recommend the patients to keep the bowels free, and to advise the physician of their first digression from the regimen. If these means fail, he must begin again until successful, for at the end of a few days the accumulation increases, the symptoms of obstruction appear, life is at stake, and the surgeon is left without any useful resources. It is sometimes necessary to give as many as ten purgatives in order to re-establish the normal passage of the alimentary substances.

The solution of foreign bodies in the intestines.—I think that I have sufficiently insisted upon the necessity of purgative treatment. It is almost absolutely impossible to dissolve concretions and enteroliths. We can do no more than administer purgatives for a long time; the patients must adopt a strict regimen and take moderate exercise.

When metallic bodies are arrested, they may be treated in a special manner by the administration of liquid acids capable of attacking the metals. The consideration of this subject with regard to foreign bodies in the stomach permits us to dispense with any lengthy remarks. For such a purpose we may use diluted solutions of vegetable acids. Bidart (Union, 1874) administered dilute sulphuric acid in a case in which the body was composed of pieces of lead. Since nature has been known to produce rupture of a fork and corrosion of knife-blades, and to cause a fortunate solution in desperate cases, the surgeon should not forget this remedy in difficult cases in which the foreign body is arrested and is doomed to produce perforation and perienteritis if it tends to leave the intestine.

3. Treatment of Complications.—The gravest complications are intestinal obstruction and perforation producing peritonitis or perienteritis. Each of these grave accidents deserves special treatment.

1. *Treatment of the obstruction.*—As we have already discussed prophylactic measures, I will not return to them, but will enter upon the treatment of confirmed obstruction. The numerous measures to which surgeons have resorted show their slight efficiency. They may be classified in two groups: 1, those which have the effect of re-establishing the passage by propelling the obstruction; 2, those which act directly upon the site of the obstruction by removing the obstacle: the latter are surgical measures, some of which are palliative, like puncture, others curative, like enterotomy.

The first group comprises a large number of remedies, some of them apparently the direct opposites of one another, but which have rendered good services in some special cases. The best of all, and undoubtedly the most rational, is purgative medication. When used in the first period, it alone may remove the obstacle and re-establish the natural passage. If saline purgatives fail, we must employ drastics, the use of which may be preceded by the administration of fifteen grammes of castor-oil, if it is well tolerated. A few drops of croton-oil may succeed in cases in which other purgatives fail. If we see the case at a more advanced stage of the disease, when vomiting has already begun, we should no longer give purgatives by the stomach. It is then better to make a hypodermic injection of some appropriate remedy, or even to imitate Sanson's plan, who, under similar circumstances, applied a small blister to the thigh and placed a drop of croton-oil upon the surface, after having removed the epidermis. He succeeded in producing an abundant evacuation in this manner. In addition to purgatives, we may employ a certain number of remedies which are used much more by the laity than by physicians. I refer to lead bullets which have been swallowed for the purpose of pushing on the arrested bodies: eighty-two were swallowed by an unfortunate who suffered from a tumor formed of fruit-stones.

In addition to lead, we may mention metallic mercury, which has been a scientific remedy, but the efficacy of which does not appear to be confirmed by any recent and authentic cases.

Fragmentation is an ingenious method, which may prove useful in some cases, if really applicable. Unfortunately its use is very limited, because it is difficult to reach the seat of the obstruction when it is deep, and forced external manipulations may prove dangerous. We must not forget that the obstruction is caused by the arrest of a stercoraceous or other foreign body, and circumstances very rarely permit their fragmentation. On the contrary, we run the risk in some cases of producing serious perforations. This is no longer true if the obstruction is due to a foreign body in a hernia, as we can then readily act upon the arrested substances and restore a free passage. Outside of these cases, fragmentation is only an extreme measure, which should precede surgical interference.

It will suffice, in passing, to mention revulsive measures, lukewarm or warm baths, counter-irritation, cold, belladonna ointment, large cups, as, for example, the pot employed by Russian peasants, and which is applied at a certain distance from the obstruction. Forced injections possess no efficacy unless they reach the obstructed point situated above the ileo-cæcal valve.

The success obtained by electrical currents has been highly praised for a certain number of years, but they do not give very definite results in

the affection under consideration. Piriou recommends a strong electrical current with slow intermissions and applied to various parts of the abdominal walls. It produces a sudden compression and violent shock in the loop of intestines, which may be sufficiently powerful to overcome the obstacle. Leroy d'Etiolles employed electricity in a different way. He placed one reophore in the anus, and the other, formed of an acupuncture needle, in the abdominal wall. The effect produced will be the advance of the obstacle, under the influence of reflex contractions of the intestine. But this action is always as slow as it is uncertain, and such measures, when they fail, are more injurious than useful, because valuable time is lost by their application, and surgical interference, when employed too late, is often useless.

2. *Surgical measures.*—These measures must be adopted when grave symptoms persist and purgatives are useless. Some are palliative, such as puncture, others, like enterotomy, are curative. Puncture is an operation whose only object is to give vent to gas which causes meteorism of the abdomen. It sometimes produces temporary relief, and enables us to delay an operation which has become necessary; but it is very rarely useful. It is performed with a somewhat large trocar over a distended loop of intestines, and may be made in several situations.

The treatment which is really useful is gastrotomy or enterotomy, according as the incision is merely parietal or also involves the intestine. In the first case we destroy the obstacle and obstruction with the fingers through the cut integuments. In the second the intestine is emptied and the foreign body withdrawn. We will very rarely be able to re-establish the natural course of the intestinal contents without cutting the intestine, except in some cases of stercoraceous tumors which are susceptible of fragmentation. Recourse is therefore usually had to enterotomy, and the patient should be anæsthetized prior to the operation. We select the flattest part of the tumor, and that in which the pains have begun, in order to make the incision, which should be from eight to ten centimetres long. The tissues are cut layer by layer on a grooved director, the greatest gentleness possible being practised. Sometimes we cannot distinguish the various layers in the abdominal walls; but even then we should make the incision very slowly. When the peritoneum is reached, the surgeon should cut it in the same manner. At times, when there is a coexisting perienteritis, the instrument, before reaching the peritoneum, encounters a collection of pus, which is immediately emptied.

At this period of the operation the serious difficulties begin. Where are the obstructed point and the foreign body, and what loop should be opened? These questions always embarrass the surgeon, who finds himself in the presence of slate-colored, softened loops of intestine adherent to one another and to the walls of the abdomen. Nevertheless he must make up his mind, must introduce a finger into the wound, and by the touch search for the region occupied by the foreign body. The information furnished by this exploration is of extreme importance, because it serves as a basis for the conduct of the surgeon. The examination should be conducted methodically and judiciously, account being taken of the condition of the parts, of the degree of softening of the gut, of the hardness of the body contained in the intestine, and of the position which it occupies. From these remarks we will readily understand that large foreign bodies or those of a peculiar form are more readily recognized than rounded foreign bodies formed of calculi or concretions. If we can move the foreign body after moderate fragmentation, or can

break it without injury to the parts, we will do well to avoid opening the organ. But these cases are rare, and we must usually perform enterotomy. For this purpose, after having determined the loop in question, we pierce the walls of the intestine with a curved needle armed with a silver wire. We then pass the two ends of the wire in succession through the abdominal walls from within outward. The corners of the wound are tied in the same manner in order to avoid extravasation of substances into the incised peritoneum. The intestine is cut between the wires, and the foreign body or obstacle to the progress of the intestinal contents is removed, as circumstances permit.

Finally, the surgeon may adopt two different plans:

1. To make an artificial anus.
2. To stitch the intestine.

The first plan is an easy one. For this purpose the operator reunites the silver wire, and endeavors to apply the abdominal wall and the lips of the external wound to those of the intestinal wound. If the suture is employed, any of the numerous plans of intestinal suture may be applied; that of Gély has met with most favor. The superficial wound may be closed by ordinary measures. In what cases must the suture be employed? I think that the indications are very rare, because a proper condition of intestinal vitality is indispensable, and this is very rarely realized when enterotomy has become necessary. It should be restricted to cases in which a large, projecting foreign body produces acute symptoms which demand prompt interference. The intestine has then not had time to change, and a suture will have some chance of holding.

As a rule, an artificial anus is made, but it is rare that an enormous infundibulum is not present, on account of the deep adhesions of the opened loop of intestines.

This event often renders the precaution of using metallic wires illusory, because the tractions exercised upon them may be insufficient to produce immediate contact of the two orifices. However this may be, when the opening is once made, the surgeon must attend to the general condition, and endeavor to maintain or re-establish the health by all possible means. He should carefully superintend the diet and avoid errors of regimen. During the first few days absolute diet is indicated if it can be well tolerated; we can restrict ourselves to the nourishment derived from nutritious enemata. As soon as we believe that the adhesions are sufficient, we may give light, nourishing dishes; finally, we should, in such cases, apply the usual rules for an artificial anus.

Results of enterotomy.—In the actual condition of science, this is a difficult thing to decide, because it has never been employed in a regular manner, and has only served, in the hands of surgeons, as a *dernier ressort.* In the large majority of cases it was employed *in extremis*, and the patients died. But it also numbers many successes when it is performed for the extraction of foreign bodies. In England it enjoys a higher reputation than in our own country. Thus, White[1] extracted a spoon, and cured his patient. He made an incision three inches long and parallel to the epigastric artery, extending above to the height of the iliac spine and involving the obliquus ext., obliquus int., and tranversalis muscles. He opened the peritoneum with a bistoury, withdrew the end of the intestine containing the spoon, cut it, and performed extraction with the forceps. Among others, Bryant recently performed two successful enterotomies.

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[1] Quoted by Poland: Guy's Hospital Reports, 1863.

We should not, therefore, reject *à priori* a method which is good in itself, if we are careful to employ it when it is indicated. Its tardy employment is not only useless, but even contraindicated and dangerous. If the incision is made during the course of an acute affection, it will cause the inflammation to extend to the peritoneum.

3. *Treatment of inflammatory complications.*—In this last paragraph on obstruction, I have in view perienteritis with perforation and fistulæ.

What has been said of ordinary cases is especially applicable when obstruction is present. We should then attempt to remove the obstacle by gentle means at first, and, if it then resists, by surgical measures, such as puncture and enterotomy. The operation is even more uncertain, because it often happens that the surgeon is ignorant of the point of departure of serious accidents and that he looks in the wrong place for the obstruction. Thus the cæcum has been cut for obstructions which were situated in the colon.

Perienteritis.—Perforations.—Surgery is impotent in those cases of primary perforation in which acute peritonitis supervenes. The symptoms are so acute that we can hardly hope to allay them. If we are perfectly well aware of the cause, does this constitute an indication for extracting the foreign body? I do not believe that surgical teaching is very definite in this respect. Nevertheless a few examples appear to prove that it would be proper to perform enterotomy and extract the object. Unfortunately the peritonitis continues its course none the less. Immobilization with a collodion cuirass and appropriate internal treatment meet with no better success.

But this is not true of cases of perienteritis with perforation, which demand special treatment. We must let nature carry on her process undisturbedly, must even favor it, and, for this reason, the patient should be kept in perfect rest and immobility. As soon as we have reason to suspect perienteritis, we should think of the chance of perforation and apply a collodion cuirass.

When the tumor has formed and pus is present, we should apply emollients or blisters; but the former application is preferable. The bowels should be kept carefully open, and we should take into consideration the peculiarities which the stools may present. After a variable length of time the skin becomes red and the fluctuation less deep than before; an incision is then indicated. It should be preferably made in the most dependent part, because an artificial anus will develop, and this precaution is then very important.

Richet, in a similar case, made several punctures with the aspirator. I do not think that this offers any real advantages over simple incision, because the latter always becomes necessary a little later. If pus alone escapes, we should act as in cases of abscess in the iliac fossa, and should drain the cavity with a tube as large round as a finger. They will only prove useful in this condition. But the surgeon should first explore the cavity of the abscess, especially if the previous symptoms lend color to the suspicion of a foreign body. The finger is the best guide for this purpose; if it cannot be used, a female catheter or rubber catheter with a mandrel will render good services. I hasten to add that this manipulation must be performed with the greatest gentleness and without injuring the parts, because any forcible traction may be followed by the most disastrous consequences, from destruction of the adhesions.

The presence of stercoraceous matters clearly indicates a pre-existing perforation and the presence of a foreign body or portion of one at the

bottom of the abscess. Exploration is also indicated in such cases, but should always be performed very gently. We should avoid tractions upon the foreign body, if it does not present itself spontaneously at the orifice, or if it is not movable in every direction in the cavity of the phlegmon. In many cases the tractions are harmless; but in some they produce rupture of the adhesions and death from peritonitis. We must exercise patience, drain the cavity, insist on cleanliness, and, above all, build up the general health, which is always very much affected by the prolonged presence of the foreign body in the intestine, and by a suppuration which sometimes continues profusely for years.

If the body is movable, we may remove it with forceps, but should avoid enlarging the external opening with the bistoury. It is preferable and less dangerous to dilate the orifice with a laminaria tent, or, better still, with prepared hollow sponge, which does not prevent the discharge.

Treatment of fistulæ.—The care with which we should explore perienteric abscesses is also applicable to fistulæ, and extraction should not be attempted until nature has rendered the foreign body movable. If we interfere earlier, if we make premature manipulations in order to detach the adhesions, life is almost always compromised. It also becomes a formal precept in such cases not to incise or extract except when the foreign body is movable and has presented itself at the external orifice of the fistula, which has been previously dilated in the manner referred to above. The mistakes occurring in the practice of distinguished surgeons convert this precept into a law which cannot be transgressed without rashness.

Treatment of foreign bodies lodged in hernia.—The intestinal loop must, above all, be evacuated. Enemata, emollients, and taxis, either for the purpose of simply emptying the intestine or of reducing the hernia, may be used in succession.

Sometimes, also, we are able to remove all the obstacles and to arrest the progress of the symptoms by the administration of water, purgative oils, and manna. They act in several ways by diluting the intestinal contents and facilitating their passage. A certain rôle has also been attributed to the contractions which they produce.

The application of taxis is subject to a certain number of exceptions. If the foreign body is pointed, or is incrusted with stercoraceous matters in such a manner as to become harmless to the intestinal canal, we should rather avoid diluting the mass, and should endeavor, by the administration of laxative enemata or mild oils, to make it pass as a whole into the lower part of the intestine. In the same way irregularities contraindicate taxis which may produce a perforation. The hernia may become inflamed, and antiphlogistics, baths, and poultices can be employed with benefit in one or the other case. In addition to the disputed indications of taxis, we should also inquire if possible into the nature of the foreign body. When the foreign body is very pointed, we may extract it by pressure; if it is doubtful, we should perform incision and extraction. Finally, in some exceptional cases, it is wise to adopt the plan pursued by Broca, in the following instance:

Observation.—Case of fistula produced by a foreign body arrested in a hernia.—An old man, sixty-six years old, who had a very old scrotal hernia, entered the hospital with a hernial fistula in which the probe revealed a foreign body. By means of a pair of forceps, Broca carried outward a solid, thin, elongated body of a brown color. Being unable to extract it completely, he attached it to a wire, which he pulled upon every day. In six days he had pulled it out four centimetres. A stronger traction broke the body,

one part making its escape, the other remaining inside. The foreign body could, however, always be felt by means of a grooved director.

Broca then made an incision, which he did not carry very far, for fear of involving the peritoneum. The extraction could not be performed, and Broca intended carrying the incision further by means of an enterotome, but this became unnecessary.

On the following day the foreign body could no longer be felt, and the fistula gave exit to some fæces. Two days later the body was found in the discharge and was recognized as the clavicle of a bird. The artificial anus persisted.

From the appearance of the substances passed by the fistula, the sigmoid flexure was involved. (Bull. Soc. chir., 1857.)

FOREIGN BODIES IN THE RECTUM.

CHAPTER I.

GENERAL CONSIDERATIONS.

All the foreign bodies of the rectum may be arranged, according to their origin, into three well-defined groups. Some, introduced through the mouth, only reach the rectum at the termination of their course; the second are formed in the rectum or adjacent parts (colon, sigmoid flexure); finally, the last are introduced directly through the anus.

1. Foreign Bodies introduced through the Mouth.—Each of these groups gives rise to a certain number of special considerations, which I will study in succession. But, for the same reasons that were previously advanced, I shall pass by in silence the causes and mechanism of introduction of the foreign bodies which have come from the upper parts of the intestine.

These foreign bodies are almost the same as those previously referred to, and their history has been given above. It is evident that they are less numerous, being diminished by the number of those whose volume, shape, or irregularities have caused them to be arrested in the first part of their course. Nevertheless the most dangerous bodies have been observed in the rectum, such as knives, forks, and pipes. Objects of moderate dimensions very frequently pass into the rectum, and do not even attract attention in the majority of cases. These include kernels, grain, vegetables, nails, needles, and coins, which are very often found in the rectal dilatation at the close of their peregrinations. Despite this almost absolute immunity, there are a certain number of accidents which may be produced in this region, and which I shall soon investigate.

2. Foreign Bodies formed in the Intestine.—The study of the causes which favor or determine the production of stercoraceous or calculous masses in the intestine is much more interesting. They are frequently observed in every-day practice, and are extremely various. In this study I only refer to the foreign bodies which form in the rectum, although many of those which are found here develop under the influence of general causes, either physiological or pathological, which have already acted upon the substances, while they were contained in the colon. All the causes which can be adduced to explain the production of concretions, stercoraceous tumors, or scybala, are most frequently predisposing and very rarely exciting. This is readily explained, if we take into consideration the long time necessary for their production. Hence the predisposing causes are either anatomical, physiological, or pathological.

1. *Predisposing anatomical causes.*—The pouches of the large intes-

tine disappear in the rectum, and their causal agency cannot, therefore, be called upon; but they are replaced by a certain number of transverse folds, described by Houston as valves. Without defining their mode of action, we can *à priori* understand the effect which they produce upon substances which are somewhat hard, especially when some other functional predisposition is also present. In addition to Houston's valvular folds, there are others, which are situated in the lower part of the rectum, and which are especially visible when the intestine is cut longitudinally and laid open. They are presented to the observer under the form of small pigeon's nests, small valvules like a half-moon, which do not project to any considerable extent, but which, in the upper part of the rectum, are prolonged laterally. Morgagni had applied to them the name "columns of the anus," and Ribes has also described them. On account of this anatomical arrangement, some foreign bodies may be arrested in the concavities of these folds and give rise to secondary accidents. This forms a sort of place of election for very small, irregular bodies, whether stercoraceous or otherwise. Huguier states that he often found abscesses at the margin of the anus which contained upholsterer's nails. In the same way fæcal matters may lodge there and form small concretions.

2. *Predisposing physiological causes.*—These are undoubtedly very effective in the production of concretions, and if they do not always suffice *per se*, at least constitute powerful aids. In the normal condition the fæces may remain for a certain length of time in the intestine, so that coprostasis, as the more or less prolonged stay of fæces in the intestines is called, is a physiological phenomenon. On the other hand, the stercoraceous matters, at the moment at which they pass from the sigmoid flexure into the rectum, are already very much thickened on account of the absorption of nutritive substances. These two factors, temporary arrest of the fæces and variable degree of thickening, play a very interesting part in the formation of concretions, and, according as they become more active, there is more chance that the latter will be produced. There is nothing more variable than the normal duration of the presence of fæces, and it is difficult, even after an exact knowledge of the temperament of the individual, to determine the period at which they should pass into the upper part of the rectum. These limits are very broad, since some persons, who are habitually constipated, do not have a passage more than once a week, although in perfect health. Certain well-known etiological factors, among which are more or less sedentary habits, professions and ways of living, also add their influence. The other element of the question, viz., the degree of consistence of the fæces, is, to a certain extent, dependent on the form of diet. The fact that certain articles of diet leave more residue than others is so well known that it is needless to dwell upon it. The cohesion and abundance of the indigestible substances which constitute the fæces is very different in the same individual, according to variations in diet, and, in the same nation, according to the nature of its nourishment. The more the farinaceous articles predominate, the more the proportion of the fæces and their cohesion increase; on the other hand, an increase of meat will diminish them. Finally, the usual or abnormal properties of certain widely used foods may also explain the unusual frequency of coprostasis among the inhabitants of the same country.

Should we not attribute to this predisposing cause the epidemic of coprostasis which was observed in Ireland, during the year 1846, by a large number of physicians (Banks, Donovan, Popham)? A large number of

individuals, especially those belonging to the poorer classes, suffered from retention of fæcal matters, which hardened in the rectum. Some have looked for the cause of such a strange epidemic in an alteration of the potatoes, which constituted the chief part of the food of the Irish during this year of dearth. Others regard it as caused by a special elective action of the juice of the solaneæ, the family to which the potato belongs. Others, finally, have, with greater judgment, explained the fact by the want of equilibrium between the fæculent and nitrogenized articles of diet, which resulted in an abnormal increase and hardness of the fæces. This is not the only known fact of this kind, but the majority are less often quoted. The use of oatmeal, which has been referred to in discussing foreign bodies of the intestines, also plays a certain part in some cases. In a word, all food which has an abundant vegetable or inorganic residue predisposes to coprostasis and to the formation of concretions.

3. *Predisposing pathological causes.*—In the great majority of cases these functional causes do not have a powerful effect, unless the lower portion of the intestine is found in abnormal conditions, and we can boldly state that almost all diseases of the rectum and anus predispose, at a given period in their course, to the formation of concretions. Among the more common ones are strictures of the rectum, paralysis, hemorrhoids, fistulæ, etc., which arrive at the same end by different means, some by producing a mechanical arrest of the intestinal contents, others by giving rise to reflex phenomena, which result in obstinate constipation. These general facts suffice to enable us to understand the importance of these etiological views with reference to prophylaxis, for we can often relieve the effect produced by suppressing the lesion of the rectum.

Old people, in whom the intestine functionates poorly, are often affected with coprostasis, and mature age presents an especial predisposition in this direction. Paresis of the intestine plays the principal part in its production. It is difficult to determine whether the strictures or narrowings, which are situated at a variable difference above the anus, are the cause or the effect of stercoraceous tumors. But the coexistence of these two phenomena is an almost constant event after the concretion has acquired a considerable size.

3. Foreign Bodies introduced into the Rectum.—The list of foreign bodies which have been introduced into the rectum is so various, and the causes are so diverse, that it will be useful to arrange those which have the greatest etiological analogies in several groups.

We must divide all the foreign bodies introduced into the rectum into five groups, according to the causes which have led to their introduction:

1. Foreign bodies introduced through traumatism.
2. Foreign bodies introduced intentionally through malice.
3. Foreign bodies introduced accidentally, in depraved sexual manipulations.
4. Foreign bodies voluntarily concealed in the rectum.
5. Foreign bodies introduced, for curative purposes, by ignorant persons or by medical men.

If we review each of these groups, we will not fail to recognize that the strangest causes often lead to the introduction of the most fantastic objects, as we will show by the following details:

1. *Foreign bodies introduced through traumatism.*—If we would believe the fantastic stories of the individuals who present themselves to the surgeon with foreign bodies in the rectum, traumatism constitutes the most frequent cause of these accidents. Impelled by a feeling of

shame, these unfortunates have been known to state that they had fallen upon the bottle which was extracted from the rectum; that it was on account of the speed acquired during a fall that a beer-glass, which was accidentally in their way, had penetrated into the anus. In confining these imaginary histories to their proper sphere, we must remember that, in very rare cases, traumatism does give rise to the presence of foreign bodies in the rectum. Several well-authenticated examples have been reported. Matters do not usually transpire in this manner, and the effect of the violence is not confined to a simple penetration, as there are almost always very serious disorders which involve the adjacent organs. Such, among others, is the following case, reported by Camper:

Observation by Camper (Prix de l'Académie de chirurgie, T. XII., p. 165.)—"A sailor fell from a mast upon some pieces of wood, fragments of which entered through the anus, even into the bladder; a urinary fistula into the rectum resulted. When consulted, at the end of a year, I could feel the pieces of wood, but they resisted extraction. The introduction of the catheter into the bladder led me to suspect that the ends of the pieces of wood were incrusted with calcareous matter. I incised the fistulous track, and in this way withdrew two oblong calculi formed at the end of two pieces of wood; the patient recovered in a very little while, and the callosity did not cause any obstruction."

We must also recall the horrible execution by impalement which some civilized nations still maintain, and the punishment which the Greeks inflicted upon an adulterer by introducing a peeled radish covered with hot ashes into the rectum. With the exception of these judicial executions, such accidental cases are rare, and may be observed in unfortunates who fall from a tree or high place upon a pointed body, which may break off in the intestine.

2. *Foreign bodies introduced intentionally through malice or perverted ideas.*—By the side of these examples, we must place those bodies which are maliciously introduced into the rectum. As a rule drunken persons are subjected to these manipulations by others, and the history of the pigtail introduced into the rectum of a prostitute is one of the most striking and classical examples of this category. Unfortunately it is not the only one in medical literature, although facts of this kind are comparatively rare. The brutal fancy of the murderers of Edward II. led them to plunge a red-hot iron into the rectum through a horn (Gross). We must admit—as in the cases in which an individual introduced a billiard-ball or a lighted candle into the anus of another person during a debauch—a true perversion of ideas, which is due to drunkenness in the great majority of cases. Certain lunatics have, with suicidal intent, or without any known cause, introduced in this manner an entire list of various, sometimes identical, foreign bodies. I will mention, as a curiosity, the case reported by Bœckel.

Observation by Bœckel.—Seventy snails in the rectum.—(Soc. méd. de Strasbourg, 1875.)—"A dealer in wood, æt. 44 years, entered the civil hospital, on July 23d, 1874. Although he had come on foot, and his intellectual faculties appeared to be intact, he only gave evasive and very vague replies concerning the disease for which he entered the hospital. With the exception of slight abdominal tympanites and the escape of very fetid gas, no symptoms could be obtained which would furnish a definite diagnosis. The patient was apyretic, did not complain of headache or nausea, but at times suffered from violent pain in the abdomen, which he attributed to a constipation of six days' duration. Volvulus was therefore very naturally thought of, and a purgative enema was ordered. Toward four o'clock in the afternoon the patient was seized with terrible pains. The slightest movement caused an exacerbation of the pains, and the efforts which he made to have an evacuation only increased his sufferings.

At this time, when the patient was exhausted and his energy lost, he made a statement to the attendant which enabled us to solve the difficulty at once. He stated that on the evening of July 17th (six days previously), having taken some wine, he made a wager with his comrades that he could swallow sixty raw snails, including the shells; he believed that he could feel them at the end of the rectum. Being called to the patient, the surgeon practised the rectal touch. When the index finger was introduced into the rectum to 0.08 above the margin of the anus, it came in contact with a series of hard, smooth bodies, of the size of a large hazel-nut, swimming and clashing against one another in a liquid mass. The rectal pouch was dilated; the mucous membrane presented no erosions or ulcerations; the anus itself was normal, and was the site neither of a fissure nor of a hemorrhoidal tumor. It was impossible to grapple these bodies with the index finger alone, and as the introduction of two fingers caused the patient to cry out with pain, chloroform was immediately administered. After the patient was anæsthetized, the three first fingers of the right hand were introduced into the rectum, and forty-five small snails were extracted in succession, together with hardened fæces. The rectal pouch being emptied, and the patient having recovered consciousness, I administered a purgative enema, which produced a copious discharge. At 9 o'clock that night the patient thought that he again felt the snails, and, in fact, the index finger introduced into the lower end of the intestine, removed fifteen snails. Like the others, they were entire and had not undergone the slightest chemical change. The patient felt markedly relieved, and during the night had a second evacuation as profuse as the first, and containing ten additional snails. On July 24th the stools became normal, and recovery occurred without the slightest accident. The perfectly intact condition of the snails renders it very probable that they were introduced into the anus, contrary to the statement of the patient.

3. *Foreign bodies introduced accidentally during depraved sexual manipulations.*—Lust is the most frequent of all the causes which lead to the introduction of foreign bodies into the rectum. The victims of these accidents are usually morally degraded, and have arrived at the last stages of physical depravity which compels them to satisfy their shameful passion by stimulating the reflex power of the rectum. How do the bodies which are used by these unfortunates enter the rectum? In consequence of what phenomena do they escape? These questions are very poorly understood. For want of a better explanation, we must admit that in this case, as in mechanical titillation of the urethral canal, the paroxysm of a violent orgasm may be accompanied by a momentary loss of feeling so that the individuals unconsciously let go the instrument of their passion. Then, as in other portions of the intestine, the absorbing power of the rectum comes into play.

It is to be remarked that old men are most often the victims of such accidents. This is a consequence of the progressive weakness of the genital powers, which is not always proportionate to the excitation of their passions. An English author has stated, but without proof, that these cases are more frequent in children and hysterical females. Observation does not verify this assertion.

I think it is useless to detail all the cases which are reported by authors; they will be published in the course of this chapter when they involve the pathology of the affection. It is sufficient to say that the most remarkable objects have been introduced into the rectum, such as pieces of wood, pebbles, balls, slate-pencils, forks, preserve-jars, beer-glasses, glass bottles, pestles. This enumeration shows to what an enormous extent the external orifice of the anus may be dilated; but we will better understand such an event, if we bear in mind that these accidents hardly ever occur except in individuals who habitually indulge in passive pæderasty and in whom the resistance of the sphincters has long disappeared. In a number of cases authors have observed the existence of an infundibuliform anus and deformity of the entire region.

4. *Foreign bodies introduced for purposes of concealment.*—In the

same way that robbers or assaulted individuals have swallowed foreign bodies, coins, etc., in order to hide them from justice or the greed of robbers; prisoners have also been known to conceal in the rectum various coins which they hoped to use in escaping from prison. The instrument in use among convicts, and which is called a "*nécessaire*," is a cylindrical box of wood, closed with a little wax. The pieces which it contains may be fitted to one another in such a manner as to form a saw or file, the box being the handle. With time and patience, prisoners have been known to saw through iron bars with the aid of these imperfect instruments. The most curious case of this kind is reported by Closmadeuc.[1] In the intestine of a young convict, who had died of peritonitis, was found a *nécessaire* which had mounted into the transverse colon. This box was cylindro-conical, contained thirty different pieces, and was covered with a layer of transparent fringe (omentum of a sheep). It was fourteen centimetres long, and weighed six hundred and fifty grammes. It had been habitually introduced by the largest part in such a manner as to be readily expelled during defecation.

In closing our remarks with reference to this group of foreign bodies in the rectum, it is proper to add that some individuals have, according to certain authors, transformed the rectum into a veritable hiding-place in which they temporarily concealed the fruits of their robberies, such as gems, diamonds, etc.[2]

5. *Foreign bodies introduced for therapeutic purposes.*—The last group of foreign bodies includes those which ignorant patients have introduced in order to procure relief or to remove an obstinate constipation, and also those which result from the interference of the physician. The credulity of certain persons with regard to the most fantastic remedies, a credulity which is as prevalent to-day as at other periods, is the sole cause of these accidents. A knowledge of the use of suppositories must be regarded as a cause. The following is a proof thereof: "A weaver, having heard a suppository spoken of, introduced into his anus the shuttle which he was using, together with the clink, and a file." In compliance with the advice of some people, patients have endeavored to relieve their sufferings by introducing various substances into the anus. In the memoirs of the old Surgical Academy, Morand reported the curious history of a monk who thus introduced a phial into the rectum. This classical case should not be passed over in silence.

Observation.—Morand's treatise, observation by Nolet.—A monk, desiring relief from a severe colic from which he was suffering, was advised to introduce into the rectum a bottle of Hungary water, in the cork of which there was a small opening, through which the water gradually distilled into the intestine (these bottles are usually long); he pushed it so far that it entered the rectum altogether, whereat he was greatly astonished. He could neither have an evacuation nor receive an enema; inflammation and death were apprehended. A mid-wife was consulted in order to see whether she could introduce her finger and extract the bottle, but she was unable to do it. Forceps, a ripping-iron, and anal speculums were useless. It could not be broken; this would have been more disastrous, as the pieces of glass would have wounded him. Finally, a little boy, eight or nine years old, was found, who introduced his hand, and had sufficient address to cure the good monk." (Mémoires de l'Académie de chirurgie.)

There are also other unfortunates who have introduced a phial or a piece of wood, pieces of soap, or tampons of flannel, in order to stop an in-

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[1] Société de chirurgie, May 15th, 1861.
[2] Molière: Maladies de l'anus et du rectum.

tractable diarrhœa. One poor-spirited fellow, in the hope of diminishing his need of eating, arrested the progress of the fæces with some large machine which he pushed through the anus into the rectum.

The foreign bodies which may result from surgical interference are the instruments which are employed in the treatment of diseases of the anus and rectum, such as canulæ, dilators, pessaries, sounds. In addition, leeches applied to the anus may enter the rectum and become fixed for a longer or shorter length of time, giving rise to accidents of a peculiar nature. These are very exceptional cases, it is true, but it is necessary to mention them.

CHAPTER II.

NATURE OF THE FOREIGN BODIES.

The nature of foreign bodies has served as a basis for a large number of classifications which are very useful in individual cases, but are too narrow. I will confine myself to mentioning them, as the etiological division is the best. Thus bodies have been divided into regular and irregular according to their shape, into solid and fragile bodies according to consistence, animate and inanimate, etc. It is difficult to unite these groups on account of the extreme variability of the individual cases.

Volume and Size of Foreign Bodies in the Rectum.—With the exception of concretions and pointed or very irregular bodies, we only find very large bodies in the rectum. Narrowness is hardly ever observed except when the foreign bodies are pointed, as fish-bones, kernels, needles, pins, nails, egg-shells;[1] these have generally been introduced into the mouth.

Observation.—Nut-shells lodged in the rectum: M. Léveillé (1822). (Jour. gén. de médecine, 1826, T. 94, p. 290.)—"Bernard, æt. 44 years, thrasher on a farm, made a wager, in a moment of drunkenness, with one of his comrades, on Nov. 8th of this year, that he could eat a quarter of a pound of nut-shells. The wager consisted of two litres of wine, which were immediately brought, together with a very large quantity of nuts. The latter having been broken, and the shells weighed, Bernard set to work while his comrades were eating the nuts.

Some glasses of wine, stipulated in the bet, excited the appetite of our nut-eater to such an extent that he was not satisfied, but demanded and readily obtained permission to eat more. The bet was more than won, and was celebrated with fresh libations. Three days elapsed without any symptoms; on the fourth, Bernard felt slight pains in the epigastric region, but not sufficiently severe to keep him from work. On the fifth and sixth days the pain increased, and the desire of going to stool was felt for the first time. This desire became more frequent, but was always unattended with an evacuation; pains in the rectum also developed. The patient then entered the Charité on the 14th of November. He presented no remarkable symptoms; the abdomen was somewhat hard and tense, the epigastric region painful, the pulse strong and frequent, the skin hot and moist; the odor arising from his bed had a fetid quality which I cannot describe. The patient then told me what had transpired, and stated that he suffered most in the anus, not in the abdomen. The pains were acute, the desire to go to stool was frequent but useless. For twelve hours he had passed no urine and the bladder was only slightly distended. The finger introduced into the rectum soon disclosed the cause of these symptoms; it was impossible

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[1] Buchanan: British Med. Journal, 1877, p. 392.

to carry it above the muscular ridge formed by the sphincter. The shells could be felt heaped upon one another, and bound together by a very small quantity of fæces; they adhered so firmly to one another that the employment of curettes and forceps was useless. It became necessary to detach the shells with the finger and extract them one by one, the extraction lasting more than half an hour. Enemata administered during the day brought away those which the finger was unable to reach. On the following day a potion was administered with castor-oil; a few evacuations then took place, and the stools resumed their natural course. Recovery after slight pains. He left cured on the 28th, promising not to sin again."

The largest bodies, on the contrary, have been introduced into the rectum through the anus. Concretions assume very variable forms. If they have developed in the rectum, they are generally large, diffuse, and irregular, and form masses which obstruct the entire cavity of the organ. When they have started from the upper portions of the intestine, the colon and sigmoid flexure, they are smaller, often multiple, much more regular, and are then known as scybala.

The limits of the size of foreign bodies introduced into the rectum are those of the normal organ, or those attained by abnormal extensibility from habitual dilatation. The diameters of bottles and beer-glasses are the largest of those which have been observed up to the present time, but we must remember that, strictly speaking, the bi-ischiadic transverse diameter is their anatomical limit. Moreover, the forceps, whose dimensions are very large, have been introduced without much difficulty in order to extract such objects. We must also bear in mind that the majority of the objects introduced are smooth, composed of slippery substances, which facilitate their introduction. Ivory, glass, ebony, porcelain pestles, and soap are among these objects and substantiate the view that the manner of their introduction renders them even more admissible.

Shape.—Like the volume, the shape also presents the peculiarity that all these foreign bodies are rounded and blunt, thus facilitating their introduction. When they are irregular like a hook, there is always one dimension which permits their ready introduction. They are usually longer than they are broad, of a conical shape, and truncated at the base; goblets, glasses, match-boxes, and the "nécessaires" of prisoners belong to this class.

Length.—Their length is a variable element, but it may be very great, as in the previously mentioned cases. A bottle extracted by Désormeaux did not measure less than nineteen centimetres in length and five and a half in diameter; that of Howinson[1] was twenty centimetres long and ten wide; and the pestle which Montanari extracted from the rectum was thirty centimetres long; the pæderast who carried it died in consequence of the introduction of another instrument of the same kind measuring fifty-five centimetres in length and which perforated the intestine. Huguier presented to the Surgical Society (1859) a wooden pipe which measured nineteen centimetres. Velpeau[2] withdrew from the anus a cologne-bottle twenty-eight centimetres in length, which had caused a projection under the false ribs without giving rise to any symptoms.

Studsgaards, of Copenhagen, quotes a very curious example of this class:

Observation.—"In the collection of the anatomo-pathological museum at Copenhagen I found an oblong, polished stone, 17 centimetres in length, 6½ centimetres broad, and from 4–5 centimetres thick, weighing 900 grammes, which a peasant of the island of Bornholm had introduced into the rectum in order to prevent a prolapse

[1] Lancet, May 25th, 1867. [2] Arch. gén. de méd., 4e Série, T. XXI.

which had annoyed him for a long time. The stone was extracted by a surgeon named Frantz Dyhr in 1756." (Bull. de la Soc. de chir., 1878, p. 660.)

An indefinite number of other cases might be added to these. Thus Jeffrey's[1] patient had introduced a piece of wood, fastened to a nail, into the rectum in order to arrest a diarrhœa; the total length of both bodies was seven inches.

The Gazette médicale de Lyon (1868) mentions a most extraordinary case. A club thirty-two centimetres long was withdrawn from the anus of a man sixty years old (Laure). The upper end had caused a projection in the right hypochondrium; the lower end was in the concavity of the sacrum. Recovery occurred. It is impossible to understand how such a long portion of the intestine could be straightened without tearing the meso-colon.

The shape may interest the surgeon when regarded from another point of view; I refer to the cavities which are so frequent in these bodies. We shall see, further on, that the hollow form may give rise to complications of a peculiar nature on account of the introduction of the mucous membrane into their interior.

The large foreign bodies are most frequently single, while those of smaller size are sometimes multiple. Next to the dry beans which were found collected in such numbers in the rectum of an old man (Laughlan) that they produced retention of urine, from compression of the bladder, and death, Bœckel's case, in which seventy snails were extracted from a man's anus, is one of the best examples of this multiplicity. Multiplicity is hardly ever observed except in those cases in which the foreign bodies have been directly introduced, since those which have come from the upper portions of the intestine are usually different unless they are of alimentary origin. However, large quantities of pins have been known to traverse the intestinal canal with varying rapidity and produce numerous accidents, while others did not manifest their presence until they had reached the edges of the anus.

Observation.—Multiple foreign bodies swallowed and passed in the stools.—Pilcher had charge of a woman who suffered from melancholia, and who stated that she had swallowed nails and pebbles in order to commit suicide. After a dose of castor-oil, the patient passed two pieces of faïence, one or two centimetres long and about the same breadth, two nails, and a pebble. The abdominal pains which developed were relieved by the application of a sinapism and a warm cataplasm. The pains reappeared during an evacuation, and, in the space of six weeks, the patient passed three hundred grammes of various bodies, including nineteen large pointed nails, a screw seven centimetres long, numerous pieces of faïence and glass, a piece of a needle, two knitting-needles, a piece of whalebone, etc. During the time that the patient had these substances in the intestines she ate and drank as usual. After their evacuation she refused to eat, and it was necessary to feed her with the œsophageal sound. (The Lancet, Vol. I., p. 23, June, 1866.)

Finally, the material of which the foreign bodies introduced into the rectum are composed varies a great deal. Wood, earth, and glass are most frequently observed. Some are very fragile, while others are solid and capable of resisting the pressure made upon them in grasping and extracting them. The therapeutic and prognostic importance of these qualities is very great, because the conduct of the surgeon varies accordingly.

Nature of Concretions.—It would be idle to dilate upon the nature

[1] The Lancet, 1868.

of stercoraceous concretions in the rectum. Those which are derived from the colon are well known ; those which develop in the rectum differ somewhat as regards their composition. They may be conglomerate, very firm, large, and have foreign bodies in the centre. In a case quoted by Jobert, a chicken-bone was found in the centre and grape-seeds in the peripheral layers. These concretions are sometimes very small and lodge in the valvular folds, in which they develop in a peculiar manner.

CHAPTER III.

SYMPTOMS.

Foreign bodies in the rectum manifest their presence by symptoms which are almost always subjective, and usually present no specific character. The nature of the affection may also remain very doubtful, both to the patient and surgeon. It is nevertheless rare that the symptoms do not lead the careful and conscientious observer to discover the true cause of the phenomena described to him or which he observes.

1. Subjective Symptoms.—I lay aside, for the present, the history of concretions, scybala, and coprostasis, because these affections assume peculiar aspects, and the following descriptions would not apply to them.

Pain is the most common symptom which is observed in cases of foreign bodies in the rectum which have either been introduced directly or have come from the mouth. But it varies very much according to the case, and appears to be the result of a normal physiological phenomenon, viz., the desire to defecate. Hence there are great variations according to the shape, irregularity, and size of the body. When the foreign body is pointed, it wounds the walls of the rectum during the efforts of defecation, and may wring sudden cries from the patient, who suffers from an intense and sudden pain. The same result is produced when one of the edges of the foreign body is sharp, because it then cuts the mucous membrane very appreciably.

Observation.—A child had swallowed a small tin cover, which gave rise to some œsophageal symptoms, and then passed into the intestine. It was not felt again until it reached the anus, when it caused the child to cry out. The mother recognized the cause of the pains, and extracted the object.

All sharp bodies, like the preceding ones, pointed pieces of bone, fruit-stones, etc., will act in this manner, but they do not become so painful until the period of defecation. If this is not produced by the presence of the foreign body, and the latter is not large, no symptoms are observed, and the patient does not suffer. When the foreign bodies have been introduced directly, matters take a different turn, as the objects are usually larger and longer than those referred to above. It is difficult to believe that glasses, bottles, spoons, pestles, etc., when introduced into the rectum, will not cause very painful symptoms, and there is reason to believe that these unfortunates experience very great suffering, if we reflect upon the false shame which they overcome and which they must have

resisted before seeking the aid of the physician. The pains are duller in such cases, but are usually accompanied by other symptoms in the vicinity, which will soon be mentioned. One characteristic of the pain, which is very often observed, is its aggravation after any effort and in certain definite positions. Thus flexion of the thigh upon the abdomen increases the suffering very much.

The irritation produced by the foreign body upon the rectal mucous membrane, as well as the desire to defecate produced by the presence of a body in the rectum, will cause spasmodic contraction of the muscular coat and of the other muscles of the floor of the pelvis. When these often unconscious efforts do not lead to a favorable result, as is usually the case, the pains increase in intensity and assume the form of very acute cutting pains, which the patients can barely endure. They may last a very long time, presenting intermissions, during which duller twinges follow the first pain. The greater the efforts made by the unfortunates to produce the discharge of the foreign body, the more they suffer, inasmuch as they often endeavor to extract it themselves, and the manipulations (usually fruitless) which they repeat in order to effect this object are very painful.

Constipation is another very frequent symptom, but several conditions are necessary for its production. The foreign body must possess a certain size or it must have produced an arrest of the fæces, conditions which, as we know, are very frequently realized. Constipation is frequent, but it may be wanting or be marked by symptoms which deceive the patients. In fact, we sometimes find the constipation coincide with muco-purulent or sanguinolent stools, which are produced by the intestinal secretion and by bodies, such as bottles, and we may thus be deceived regarding the nature of the accident. Internal hemorrhoids, etc., are not manifested by the same symptoms, and, if the carrier of such bodies does not inform the surgeon, the latter may fall into error if he does not practise the rectal touch. When constipation is present, it may be absolute and resist all remedies, a symptom which is not found in other affections of the same region.

In almost all cases, disorders on the part of the genito-urinary organs appeared at a period more or less close to the onset of the symptoms. Sometimes they develop from the beginning, and acquire such an intensity that the patient or physician, being led into error, looks for the origin of the affection in these disturbances. Compression evidently plays a great part in producing the retention of urine which is then observed, but the reflexes, to which the unfortunates sometimes resort at the beginning of their mishap, are not unconnected with it. The urinary pains promptly increase in all cases and add their intensity to those of the cutting pains, so that the situation becomes intolerable and assistance is absolutely necessary. These later symptoms are rarely observed, because resolution must occur, and the imminence of rapid death removes all the scruples of the patients. How often would death hide the secret of their accident, if the pains and the instinct of self-preservation did not force them to make a confession!

Finally, we sometimes observe cold sweats and even convulsions, a phenomenon which is not astonishing, in view of the intensity of the functional disturbances. During the entire time that the rectal symptoms continue, the appetite is lost and sleep is prevented; the general feebleness then rapidly increases.

Physical Signs.—Physical signs are usually absent, especially when

the foreign body has descended from the upper portion of the intestine. There is no deformity of the parts, the abdominal tympanites is very moderate, and no tumor can be felt externally. When a foreign body, however small it may be, has been introduced through the anus, we will not unfrequently notice lesions of the anus, consisting of an œdematous and cyanotic puffiness; in addition, the organ is very often infundibuliform. With the aid of the hands the surgeon separates the buttocks, and finds the anal orifice looking as if it had been forced outward and presenting an appearance which is not comparable to the ordinary pathological conditions. But this appearance is only found in some cases, and hemorrhoids, which are presented so often by old men who are also predisposed to foreign bodies in the rectum, may also appear like an enormous purplish black tumor.

But the condition of the anus is rarely normal, and, even in very simple cases we find a very marked constriction of the sphincters. This has been especially referred to by Alibran, who found it difficult, during the attempts at extraction, to overcome the constriction of the rectum.

Under some circumstances this constriction gives place to a temporary relaxation, which is only produced in certain positions. Thus large foreign bodies, like glasses, have been observed which produced spasmodic constriction of the sphincter, except when the patient bent down as if going to stool; this movement was then accompanied by the discharge of muco-sanguinolent discharges. Hemorrhage is rare, and constitutes rather an accident than a symptom, except in cases of the introduction of leeches within the anus, because the flow of blood, together with an abnormal piercing pain, then forms the only appreciable symptom.

We will also mention the existence of a tumor which pushes the perineum downward, when the foreign body is at all large. This sign is useful, because it may put us on the track of the affection, and the attention of the physician is very often attracted to it. In fact, certain patients diminish the pain which this pressure produces in the perineum by compressing the region from below upward.

But the only important objective signs are furnished by rectal touch. If the foreign body is situated very high, exploration may be interfered with. We must then resort to the speculum, and the examination of the sigmoid flexure will disclose the origin of the symptoms. We can usually reach the foreign body, and this enables us to determine its shape, situation, position, and some of its physical qualities. They are usually fixed, unless their polished surface renders them movable; they dilate the rectum in one or more directions, and, when they are somewhat large, are situated by preference at a distance of five to six centimeters above the anus. On the other hand, those which are small, and have passed through the intestine, are usually arrested at the anus, where they become fixed, implanted in the wall, and sometimes joined to it.

When the bodies are very large or long, they have been detected through the abdominal walls. Sometimes even, as in Velpeau's case, phials, clubs, and bottles form a tumor under the false ribs or abdomen. Some bodies mount very high in the rectum, under the influence of antiperistaltic movements and the contractions of the sphincter. As a rule, their conical shape contributes greatly toward favoring this ascension in an opposite direction to the course of the intestinal contents; thus the *nécessaire* of Closmadeuc's convict was a truncated cone, the stone of the American sailor was ovoid.

Symptoms of Concretions and Coprostasis.—Concretions and mass-

es of stercoraceous matters present very different symptoms according to the period in which we investigate them. The first, characterized by almost absolute indolence, may last a very long time, on account of the very slow formation of the concretions. In the second, subjective symptoms appear, and are more intense the greater the size of the foreign body. With slight exceptions, the symptoms are almost the same as those of other foreign bodies, but the pains are duller, less acute, and deceive the patient and physician more readily. Habitual constipation is the chief symptom, but it is not absolute, and does not exclude the discharge, by efforts of defecation, of mucous or muco-sanguinolent and sometimes very fluid passages. They are usually abundant, and during the progress of the disease, if the latter is not recognized, may become purulent.

A very peculiar feeling of weight accompanies the constipation. This is situated at the lower end of the rectum, and irradiates into the perineum, the loins, and sometimes into the lower limbs. All movements increase it, and the patients, by an instinctive movement, compress the anal and anterior perineal regions, in order to somewhat diminish this disagreeable sensation. Walking and riding cause pain, cold sweats, and faintness, and all the symptoms assume a more painful character during efforts of defecation. We then observe hemorrhoids, which deceive the patients with regard to the real cause of their sufferings, and they may even be the site of ulceration and the cause of the streaks which are found in the mucous dejections of the irritated rectum. At the same time a tumor is present which causes the perineum to project downward, and gives the region a peculiar appearance.

The abdomen is sometimes tympanitic, and this is more marked, because the difficulty in defecation favors the accumulation of fæces. Moreover, we may, to a certain extent, take cognizance of the existence of a tumor by exploring the abdomen and rectum. Palpation of the abdomen, especially of the left iliac fossa, may enable us to discover a very indolent tumor, which is situated deeply, and which may often be reached by the rectal touch. However, we cannot always reach the site of the foreign body with the finger, when the former is situated in the upper part of the rectum. I saw one case of this kind in which the mass of fæces projected above the left Fallopian ligament and into the inguinal region, in which it formed such a strange tumor that it was mistaken for a neoplasm. In this case the tumor could not be reached by the rectal touch. However this may be, direct exploration usually furnishes very useful indications with regard to the position, size, and mobility of the stercoraceous tumor.

The symptoms are also the same in small and multiple foreign bodies which have been introduced by the mouth or anus. Thus, dry beans and snails may act like scybala.

CHAPTER IV.

THE FATE OF FOREIGN BODIES IN THE RECTUM.—COMPLICATIONS.

After foreign bodies have arrived in the rectum, whether they were formed there or introduced from without, they may either be expelled by the unaided forces of nature in the time usually required for the expulsion

of stercoraceous matters, or they may remain there for a longer or shorter period. In this second event:

1. The foreign body may be tolerated, and not produce any symptoms.

2. Its presence may produce various inflammatory accidents, hemorrhages from ulceration, etc., and invaginations.

3. It may also act mechanically, by arresting the progress of the fæces and producing the symptoms of obstruction.

1. Spontaneous Expulsion.—A large number of foreign bodies pass into the rectum, and are not arrested there longer than other stercoraceous substances. Those which have been introduced through the mouth, and have a moderate size and regular shape, constitute the major portion. The progress of these foreign bodies is usually so latent that the patients are ignorant of their existence, unless they experience some difficulty in defecation. The pits of fruits, such as cherries, plums, oranges, and small coins, act in this manner in the rectum. This is the ordinary course of the most favorable cases; but it may not be so simple, and we notice various degrees of intensity in the phenomena accompanying expulsion. While the previous symptoms are but slightly marked, or altogether absent, those, on the contrary, which supervene at the moment of expulsion are often very serious, and are extremely variable in their intensity. Sometimes only a temporary obstruction is observed during the expulsion of the fæcal mass, and sometimes an acute, sharp pain, caused by pricking of the anus by the foreign body (plum and prune pits, pieces of bone, etc.). In the mildest cases the latter is the only symptom, and its very short duration does not otherwise attract attention. If the expulsive pain is more intense, it is due to some lesion of the wall, may arrest the physiological movement for a few moments, and is accompanied by streaks of blood which are noticed on the fæces. Even then the final symptoms are not of long duration, and within a few hours the previous condition is restored.

Such is the mechanism of spontaneous expulsion in the case of foreign bodies which have come from the intestine. It differs slightly from the tableau presented by patients suffering from coprostasis, in which the affection is terminated by expulsion. There is always a previous condition of constipation, which does not exceed the ordinary limits of duration in constipated individuals, and the expulsion of scybala and the paroxysms which accompany their discharge are only reproduced, at very distant intervals, after several days of relative calm. When the expulsive period begins, it is announced by a sensation of weight, a feeling of desire much greater than normal and not proportionate to the quantity of matter discharged. There is a general swelling of the entire lower part of the rectum and anus, which is shown by enlargement of the hemorrhoids and the formation of an external swelling. As soon as the physiological contractions begin, the swelling increases, and there is a great analogy between the symptoms occurring in coprostasis and in hemorrhoids. The extremely intense expulsive pains have no good effect on the advance of the rectal contents, but they increase the stasis of blood and the projection of the external tumor, which may even involve a part of the rectal mucous membrane. One author has compared the appearance of the region at this period to a breast, the nipple of which is formed by the anus, the peripheral part[1] by the bulging perineum and the pro-

[1] Mollière: Traité des maladies du rectum.

jecting coccygeal portion. The efforts follow one another without any other result than the discharge of some sanguinolent, mucous passages. The paroxysm may last a quarter of an hour or more, without terminating in the expulsion of the concretions. Not unfrequently, after several successive paroxysms, the foreign body becomes movable and leaves the rectum. Defecation becomes one of the most serious occupations in the existence of these persons when the disease relapses. However, as the most common precautions, such as the use of enemata, will put an end to them, we rarely have an opportunity of observing these multiple paroxysms.

When the foreign body is formed by a confused mass of conglomerate fæces, the symptoms appear slightly different. For example, the constipation may last a very long time, and an accumulation may occur above the arrested mass; as they grow thicker, they become drier, because the fluids are gradually absorbed by the rectum. Matters may remain in this condition for one or two weeks, or even a month, without the desire to defecate being felt in an imperative manner during the entire period. When the symptoms begin they are very acute, and react upon the adjacent organs, interfering with the emission of urine and causing pains in all the neighboring regions and even in the lower limbs. The abdomen is tympanitic, the appetite disappears, the headache is intense, and the condition is a very serious one. The most serious complications may follow these symptoms, or expulsion, sometimes spontaneous, takes place. This develops suddenly, and the symptoms disappear at once. The patients pass an enormous amount in rapid succession, and sometimes whole pailfuls. The general relief obtained, and the temporary colic pains which are produced by the passage of the accumulated contents, mask the special phenomena produced in the lower part of the rectum which is not the seat of acute pain. After the evacuation all the symptoms disappear in a few days, and the health becomes re-established if the predisposing causes do not continue to act.

Finally, cases of expulsion of foreign bodies introduced through the anus have also been noted, but I am only acquainted with Weigand's and Sée's cases.

Observation.—Spontaneous expulsion of a long piece of wood, after having been retained thirty-one days (Schmidt's Annalen, 113, IV., p. 95, 1862).—Dr. Weigand, physician in Wimpfen (Wuertemb. Corr.-Bl., XXX., 44, 1860) reports a case in which a piece of wood, five inches long (0.1353 m.), introduced deep into the rectum, was eliminated spontaneously after a stay of thirty-one days, without being followed by serious results.

A farmer, æt. 68 years, of a robust constitution, but somewhat stupid, introduced into the anus a cylindrical piece of wood for the purpose of relieving his obstinate constipation. However, he performed the manipulation so unskilfuly that the piece of wood broke and remained partly within the rectum. All attempts made to remove the foreign body failed; two days later he suffered from abdominal and lumbar pains, dysuria, and constipation. Weigand, being consulted by the physician, recognized the symptoms of enteritis. As the introduction of the finger into the rectum did not demonstrate the presence of a foreign body, he restricted himself to combating the inflammatory symptoms and pain (calomel, enemata, narcotics, leeches). On the eleventh day a purulent, sanguinolent, fetid fluid was evacuated, after which the patient felt markedly relieved; but it was impossible to discover any trace of the piece of wood. Weigand then expressed serious doubts as to whether a foreign body was really contained in the rectum; but as the patient resolutely maintained that he continued to feel the piece of wood, renewed search was made, until the finger, being introduced far in, encountered a rough, hard object, which it was impossible to seize for want of proper instruments. As circumstances did not indicate a necessity for more active treatment, Weigand contented himself with giving the patient, from time to time, two

or three spoonfuls of castor-oil, which always produced the discharge of a small amount of muco-sanguinolent fæces. At this time the lumbar and abdominal pains again appeared more frequently, and, on the other hand, the patient's former appetite being gradually restored, he walked about, and attended to light domestic duties; on the 31st day after the accident, after having taken three spoonfuls of castor-oil, he stated that he had an intense desire to go to stool, when, in addition to blood and pus, the piece of wood made its appearance, 0.1353 m. long, 0.027 thick, cylindrical, serrated at the broken end, and roughened on the cylindrical surface; in fact, it was the end of a pole with which bean-vines are propped. The patient recovered entirely without having been subjected to any further treatment.

2. The Foreign Body remains for a Variable Period.—The nature of the rectal functions enables us to understand why the tolerance of foreign bodies is so limited. Irritation occurs sooner or later and produces acute or chronic symptoms. Examples of tolerance, if they do exist, are very rare, and I merely refer to such a possibility without otherwise insisting upon it.

The foreign bodies, in very rare instances, become incrusted with calcareous salts; this is a very peculiar fact, which is not easily explained. The only case of incrustation observed occurred in an old man.

Observation.—Foreign body in the rectum.—Calcareous incrustation on its surface: Dr. Dahlenkampf.—The author was consulted by a man, sixty-five years of age, who had suffered for ten years from severe pains in the right side of the perineum and in the rectum, especially during defecation, the fæces being usually covered with pus and blood, and, when they were solid, were flattened instead of being rounded. The pains frequently extended to the knee, hypogastrium, and the lumbar regions, the suffering being greater when he flexed the body forward.

He was unable to sleep except when he lay on the belly, and could only sit on an open seat. Six months ago a fistulous opening developed in the right buttock, through which a large quantity of ichorous, sanguinolent fluid, and even gas passed. At the period to which we refer, the patient, who had previously enjoyed perfect health, while carrying a load in a forest, and, being taken with the desire to go to stool, attempted to have an evacuation. But his foot slipped from under him while he was crouching and he fell to the ground, which was covered with pieces of wood of various shapes. At the same moment he felt a sharp pain in the anus and even within the rectum. But as this did not last long, he paid no further attention to it, and it was not until the lapse of several weeks that the difficulties in defecation led him to seek the aid of a physician. The first exploration revealed nothing, and emollient treatment was ordered, especially laxatives, which relieved him considerably. Dr. Dahlenkampf, suspecting the presence of a foreign body, introduced a sound into the fistulous opening, and pushed it in to the depth of five inches. Here it struck against a solid body at the side of the rectum, and the index finger, introduced into the anus, came in contact with a movable foreign body. Ringed forceps carried along the finger succeeded in extracting the body, and this presented no difficulties except in disengaging it from the folds of the mucous membrane. When withdrawn, it was found to be a piece of oak, partly covered with bark, four and a half inches long, and six lines thick at the upper end, which terminated in a point; the lower end was bevelled, and was as large as a barrel of a pen. The body was covered, over half its surface, with a saline incrustation of a brilliant, silvery appearance, regularly crystallized, and composed of phosphate of lime, as was shown upon analysis. The use of soothing enemata and a good diet sufficed to restore the general health of the patient; the pains disappeared entirely, and only the fistula remained, which he would not allow to be operated upon. (Heidelberg klin. Annalen, 1829.)

The foreign bodies which are lodged in the rectum may act in the following manner:

1. Produce primary traumatic lesions.
2. Produce chronic changes in the rectum.
3. Give rise to inflammatory symptoms.
4. Cause obstruction.

It is not without reason that I have omitted to mention spontaneous

expulsion after arrest in the rectum for a certain length of time, because the discharge of the foreign bodies does not occur naturally when they do not follow the normal course of the intestinal contents. They are then always accompanied by some of the symptoms mentioned above.

1. Primary Traumatic Lesions.—My plan does not include a lengthy discussion of the lesions which may be produced by foreign bodies in the rectum. Only a few well-described cases are known, and the lesions observed are so grave that death is the inevitable consequence. I saw one unfortunate who was impaled by falling upon a stake, and whose rectum and perineum, being detached, had been driven back into the abdomen. Camper's observation, which was previously quoted, shows that we must not give too gloomy a prognosis if the peritoneum is not largely involved, and that, consequently, there is a very marked difference between injuries of the lower and those of the upper part of the rectum. If the peritoneum has been involved, peritonitis develops on account of the extravasations into its cavity, and generally terminates in death.

2. Chronic Changes and Ulcerations of the Rectum.—When a foreign body remains in the rectum for a long time, as may happen when its size, shape, or other properties are not entirely incompatible with the functions of the organ, we observe a series of lesions which have a double origin, according to the individual case. Either the excentric pressure exercised by the foreign body may produce an ulceration from gangrene, or the normal or exaggerated contraction of the muscular coat may cause it to be wounded by the irregularities of the foreign body from concentric pressure. An illustration will give us a better idea of the genesis of these rectal ulcerations. If a small but irregular bone is situated in the rectum and its oblique or perpendicular position to the axis of the canal does not give rise to its spontaneous expulsion by the contractions during defecation, the mucous membrane will be wounded from the pressure on the foreign body. On the other hand, a large body, like a round matchbox, will ulcerate the rectum, and, on account of its size, may produce much more extensive lesions than the preceding ones. While the first are small and confined to one spot, the second, on the contrary, are annular, occupying the entire circumference or a part of the mucous membrane. All the stercoraceous concretions which are slowly developed produce analogous disorders.

If the foreign body is very long and not large, it will give rise to somewhat different ulcerations. In such cases the lower extremity is found in the concavity of the sacrum pressing upon the posterior part of the organ; the upper end, on the contrary, presses much more strongly on a part of the rectum or sigmoid flexure, as a long object will straighten the normal curve of this portion of the intestine with much more force. Hence two ulcerations result: the one above, the other below, upon two diametrically opposite points. These lesions have been observed in numerous cases.

The ulcerations resulting from an injury are therefore produced by the irregularities of the body or by an irritating action due to the persistent contact of a hard body with the walls of the rectum. In a general way, even in cases in which a needle is imbedded, there is always a slight amount of gangrene of the mucous membrane at the point at which the ulceration occurs, and this gangrene will be produced more rapidly if the foreign body is large or irregular. The ulcerations in cases of coprostasis are developed more slowly and are most extensive.

The ulcerated surface secretes pus, which is mixed with the normal

mucosities and the substances passed in the stools. It very often bleeds, and may thus give rise to error, because if the cause disappears or is unknown, we may think that other diseases are present (epithelioma, etc.). In some cases these streaks of blood may be replaced by a true hemorrhage. Tompsett has reported a very interesting case, in which the hemorrhage threatened the patient's life.

Observation.—One Friday I was called in great haste to see a laboring man, sixty-five years old, who had a very profuse rectal hemorrhage. I found him very weak, pulseless, the lips blanched, the limbs cold and livid. He was continually tossing around in bed, and, although he did not complain, I thought him very sick. I found the stools filled with blood, and he had previously passed considerable. On making an exploration with the finger, I found a hard body which was not fæces. This body was situated high up in the rectum, the lower part being movable, but the upper part appeared fixed. "At first the patient did not wish to make any statement, but he then confessed that he had introduced the body on the previous Wednesday in order to cause the bowels to act." Tompsett extracted the body with a long polypus forceps. It was a large cylindrical match-box, which measured six inches in circumference, two and a quarter inches in length, and an inch and three-quarters in diameter. He had a veritable outpouring of fæces, and all the symptoms then ceased under the influence of special treatment. Recovery. (Tompsett: Lancet, T. I., p. 448, 1869.)

The vicinity of the rich hemorrhoidal plexuses sufficiently explains the production of hemorrhage, and we can understand that this accident should occur when the muscular coat is destroyed at a point which corresponds to some projecting bone.

Another variety of ulcerations has also been observed, which is produced by very small foreign bodies or stercoraceous concretions which are abnormally lodged in a valvular fold of the rectum and give rise to the formation of small culs-de-sac. The ulceration only occurs slowly, and then immediately gives rise to an internal blind fistula. This etiology of fistulæ *in ano* is perfectly admissible, but it is purely hypothetical, because the first period of their formation has not been observed directly.

What becomes of these ulcerations? Some recover promptly when the cause which produced them ceases to act and is not renewed; others, under the persistent influence of the latter, continue to extend, become deeper, and may then cause perforations by progressive and successive thinning of the three coats, and produce inflammation of the cellular tissue and adjacent organs.

Finally, some of these chronic ulcerations, after having secreted for a very long time, give rise to cicatricial strictures of the rectum, which favor relapses.

3. Invagination of the Rectum.—We must now refer to a very rare accident, viz., the invagination of the mucous membrane in the foreign body, which some authors have had occasion to observe.

The existence of a hollow object is the indispensable condition, but it may be realized in very different ways. Thus this accident has been known to be produced by a box of preserves without a bottom, and at other times by an intestinal concretion or a pessary.

The invagination through an annular concretion is even more curious than the others, because the existence of the invagination does not interfere with the functions of the rectum, the passages being regular. In all cases the portion thus invaginated was the upper part, a fact which is readily explained if we bear in mind the nature and intensity of the natural efforts to expel the foreign body. Finally, the length of the arrest of the foreign body does not appear to be indifferent, because it is

necessary that the object or obstacle must have been present for some time.

In Desault's case, the box of preserves had been arrested for a week.

Observation.—Case of invagination of the rectum in the interior of a foreign body. (Desault: Jour. de chir., T. III., p. 177).—A man, æt. 47 years, entered the Hôtel-Dieu, on April 17th, 1762, in order to have a crockery vessel extracted from his rectum, which he had introduced a week previously, in order to overcome, as he said, his obstinate constipation. This vessel was a preserve-jar, the handle of which was broken and the bottom detached. It was conical in shape, and three inches long; it had been introduced by the smaller end, which was two inches in diameter.

When the patient presented himself at the hospital, he had already made efforts to extract the foreign body, but an escape of blood and the excessive pains had compelled him to suspend his efforts. The upper part of the rectum was infolded and invaginated in the vessel, and formed a very hard tumor, which filled it completely. The surrounding parts were inflamed, and this fact rendered the extraction more difficult. Desault made the patient lie upon the side, and then, separating the intestine from the walls of the vessel, he succeeded in seizing the latter with a strong extractor, which he pushed up as far as possible and which was held by an assistant. By means of this point of support, and with another extractor introduced in the same manner, he succeeded in breaking the vessel and in extracting it in small pieces without wounding the rectum. The operation was neither long nor painful, although it was necessary to introduce the extractors a large number of times. After all the pieces had been removed, Desault pushed back the inverted portion of the rectum, by means of a charpie tampon six inches long and two and a half in diameter, which he pushed in altogether after having covered it with cerate. Below this were placed a large amount of charpie, several compresses, and a triangular bandage which supported the whole dressing. The dressing was renewed twice a day, on account of the relaxation, which did not cease until the sixth day. Then the intestine no longer protruded when the patient went to stool, and such large tampons were not required. They were discontinued entirely after the tenth day, when the ruptures had cicatrized, and the man left the hospital entirely cured, two weeks after the operation.

The other example which science possesses also deserves special mention, and we find that it occurred with symptoms of obstruction. This is a case of invagination of the mucous membrane in the centre of an annular stercoraceous concretion.[1]

4. Inflammatory Lesions.—The prolonged presence of organic or other foreign bodies in the rectum gives rise, in a large number of cases, to the development of inflammatory symptoms which vary greatly in their intensity and gravity. When the inflammation occurs, it usually involves the cellular tissue which surrounds the muscular coat of the rectum, and is propagated, to a greater or less extent, to the adjacent organs. But it is usually preceded by a perforation or rupture, which puts the surrounding tissue in contact with the foreign body or stercoraceous matters. Moreover, the rectum may react like other portions of the intestinal tract, and abscesses or phlegmons may be produced without a primary perforation. It is true that perforation takes place shortly afterward, but it is not absolutely fatal. The considerations which have been entered into at length, with regard to foreign bodies of the intestine, will also find application here.

Since perforations or ruptures are the usual causes of inflammation, of what nature are these lesions? The remarks made on the production of the ulcerations enable us to understand how the gangrene, from prolonged pressure, by altering the coats of the rectum, sometimes leads to perforation. On the other hand, the lesion may be sudden, when an irregular foreign body is imbedded in the wall and traverses it, as happens

[1] Bulletin de thérapeutique, 1857, T. 53, p. 377.

with pieces of bone and pins. In order to be complete, we must also mention the perforations by very long foreign bodies which produce a deflection of the intestine, the external blind fistulæ containing foreign bodies which act in the beginning like those which are lodged in diverticula of the small intestine, and, finally, the perforations from rupture in cases of obstruction.

On account of the character of these accidents, their gravity and treatment, the inflammatory lesions should be studied separately, according as the perforation is situated at a point at which the peritoneum covers the rectum, or in the posterior and inferior portions in which it is not present.

1. Inflammatory Accidents in those Portions of the Rectum which are covered by the Peritoneum.—I will briefly recall that the peritoneum forms a vesico-rectal cul-de-sac, which usually descends as far as the prostate, but may descend much lower, according to age and individual peculiarity; in woman this cul-de-sac is the utero-rectal. The serous membrane then curves backward, and covers the anterior surface of the upper third of the rectum, forming a meso-rectum behind. It follows, from this arrangement, that the largest portion of the rectum is not in direct relation with the peritoneum, which thus constitutes a relative immunity and less degree of gravity for surrounding abscesses.

When inflammation occurs, it presents itself under two forms:

1st, diffuse general peritonitis; 2d, localized or pelvic peritonitis, and perienteritis.

A. *Acute peritonitis.*—Whenever the perforation occurs suddenly, as in cases of rupture of an obstructed rectum, or from the pressure of an irregular and large body, acute peritonitis supervenes. Not only is it lighted up by the presence of the foreign body, but the extravasation of fæces renders it almost inevitable.

I do not know of any authentic exceptions to this rule. When it develops, the very acute local symptoms and the moderate primary reaction are followed by the entire array of symptoms belonging to peritonitis, to which I shall not refer. Death occurs within a few days, and the autopsy shows the presence of poorly formed, fetid, reddish or blackish pus in the cavity of the pelvis; the rectum is thickened, slate-colored, semi-gangrenous, and presents a perforation, which is often very small, through which the foreign body sometimes passes.

The following case is interesting, on account of the rapidity of the symptoms:

Observation by J. Lane.—Perforation of the rectum by foreign bodies.—Coincidence of strangulated hernia.—Death from peritonitis.—A policeman, æt. fifty years, entered St. Mary's Hospital, on March 30th, for strangulation of a left inguino-scrotal hernia. He was very dangerously sick; vomiting, pain in the scrotum and entire abdomen. He stated that he had had the hernia for several years, but that it had remained indolent until the last few days. Dr. Owen anæsthetized the patient, and succeeded in reducing the hernia. The stercoraceous vomiting nevertheless continued on the following day, and the patient presented all the symptoms of peritonitis. The hernia had been reduced very readily. Lane found a round, hard mass, as large as an apple, in the rectum. He extracted it, and found a second; they were composed of pads of flannel. The finger was then able to feel a still harder mass; an enema being administered enabled him to extract two large pieces of soap, three inches long and as many in width. After this the condition of the patient rapidly sunk; feebleness and excruciating pains; collapse and death.

General peritonitis was found on autopsy, with sero-pus in the pelvis; scattered adhesions and false membranes, especially abundant over the hernial portion. The rectum was black. An extravasation of fæces had occurred through a perforation which was situated in the upper part of the rectum. It was learned that this man,

suffering from diarrhœa, and being compelled to go on duty, conceived the idea of pushing these four objects into the rectum, in order to prevent his clothes from being soiled. His wife was unable to remove them on the next day, and the patient died forty-eight hours later. It is probable that the displacement of one of the pieces of soap had given rise to the extravasation into the peritoneum, and the acute peritonitis. (British Medical Journal, May 9, 1874.)

B. *Circumscribed peritonitis and perienteritis.—perivesical phlegmon.*—Thanks to the subterfuges to which nature resorts when circumstances give her time to protect the economy, cases of circumscribed peritonitis and abscess are not very rare. The remarks I have previously made enable us to judge of the importance of the element time in this connection. We must also add another element, viz., the nature of the foreign body which is lodged in this portion of the intestine. They are usually stercoraceous tumors or concretions lodged on Houston's valve, and which are sometimes composed of true foreign bodies (bones, kernels, etc.) and of hardened fæces. When the tolerance has existed for a certain length of time, peritoneal adhesions form and unite the anterior part of the rectum to the posterior part of the bladder. In the same way the infiltration is propagated to the lateral portions. We may, to a certain extent, determine the period at which these adhesions form, because they are accompanied by urinary disturbances, as I have been able to verify in one case. During this time the ulcerative process in the swollen and softened rectum continually progresses. Notwithstanding, the phlegmon or peritonitis is characterized by general symptoms, such as fever, abdominal tympanites, acute pain on pressure, constipation, dysuria. They develop under the influence of a perforation or even without a perforation, when the softened coats of the rectum do not present a sufficient barrier to the substances which may slightly filtrate through them and irritate the cellular tissue which is ready to be inflamed. Externally we sometimes observe nothing beyond very marked tympanites and abnormal sensibility of the lower part of the adomen; the introduction of a finger or suppository in the rectum is very painful. However, when the inflammation occupies the lateral parts, it forms a tumor, which can be detected deep in, not at the bottom of the iliac fossa, but between the latter and the bladder. Palpation enables us to feel at this point a diffuse tumefaction or a very circumscribed hard swelling, which presents the appearance of a tumor. The precise situation of this phlegmon is in the upper strait between the bladder and the cotyloid cavity above the levator ani.

In some cases, for instance when the foreign body or mass of fæces has been expelled, resolution may occur, but this is exceptional. Suppuration usually occurs eight or ten days after the first symptoms, but sometimes after a much longer period. The skin of the abdomen slowly reddens, and, if the tumor is perceptible, we may feel fluctuation.

How do these circumscribed phlegmons or peritonitides terminate? I wish to speak of resolution during the period of formation. It is not often observed after the pus has already collected, and everything leads us to believe that the resolution of collections, mentioned by some authors, referred to simple infiltrations. In the large majority of cases we must admit that the pus is not absorbed, and that it will open somewhere. In fact, it always spreads toward some neighboring organ, and may thus open into the peritoneum, rectum, bladder, abdomen, or perineum.

These numerous terminations are all supported by cases, and the attention which has been paid during the last few years to the pathology of

the superior pelvi-rectal space has enabled us to better understand these various occurrences. (Pelvic cellulitis of Bouilly.)

When the collection opens into the peritoneum, the patient succumbs to a rapid peritonitis; but this termination is rare, and results from the rupture of adhesions, or from an unfortunate interference.

The opening into the rectum follows the perforation, and is produced when the expulsion of the foreign body or of the accumulated substances has taken place. We can understand that the communication may be established even when the foreign body remains, because the thinned and ulcerated rectum offers much less resistance. In whatever manner these events happen, the opening of the phlegmon is shown by the discharge of a large quantity of pus through the anus, accompanied by a marked improvement in all the symptoms; we may even find the hardened mass discharged with the pus.

From this time on we have to deal with an abscess of the superior pelvi-rectal space which has opened into the rectum, and the affection assumes a chronic course.

Perforation into the bladder.—This termination is very rare, but it has been observed in some cases. The perforation of the bladder is sometimes indicated by a large quantity of pus in the urine; sometimes, on the contrary, we find but very little in the midst of substances of fæcal origin, which are deposited at the bottom of the vessel. This difference depends upon the fact that the perforation of the bladder may occur with hardly any suppuration, in cases in which the foreign body in the rectum compresses the posterior portion of this organ. Then, after adhesion and infiltration of the peritoneum, the cellular tissue, and the recto-vesical cul-de-sac, ulceration occurs by degrees under the influence of pressure, and the wall of the bladder is opened after a variable length of time. A recto-vesical fistula is thus produced, through which the pus of the intermediate abscess (when it exists), and sometimes fæces, pass. Not very infrequently we find that the foreign body itself leaves the rectum to pass through this opening, and falls into the bladder. The escape of gas from the urethra, and the emission of a frothy urine have been remarked by the patients in several instances.

Observation.—Plater reports that a man passed, by the urethra, several small bones, which he had swallowed while eating. These bones, by their irregularities, caused an inflammation of the rectum, which was followed by suppuration and loss of substance. The small bones passed through this opening into the bladder, and were then discharged in the urine.

Bartholin and Borel mention similar cases. The literature contains a few more recent examples, and I here call attention to the discussion which was carried on, during the last century, among the surgeons, who thought that the communications of the small intestine with the bladder were very rare, and that the cases in which they existed were recto-vesical fistula. It will suffice to mention the possibility of this termination.

Perforation of the abdomen.—If the reader remembers the description of the peri-vesical tumors of which I spoke above, he will understand that the pus of the phlegmon can open into the abdominal wall. In this event adhesions form between the tumor and the abdominal wall; the skin reddens, becomes glossy, bulges out, is thinned, and the abscess opens spontaneously. One or more fistulæ may thus form and give vent to a great deal of pus. Every surgeon has met with these collections, which differ from abscesses of the iliac fossa by their lower and more internal situation. The orifices of the fistulæ are also found more internally, and some-

times very close to the *linea alba.* The suppuration continues to be very profuse even after the removal of the foreign bodies. These abscesses are especially subject to frequent relapses.

Perforation of the perineum.—The course of the pus toward the perineal region has been studied for several years past, especially by Prof. Richet,[1] but it is not well undertood even at the present day. The collection opens between the levator ani and the rectum, although we do not know the precise manner in which the pus passes through the floor of the pelvis, as there are few cellular interstices. Must we not admit a gradual perforation of the pelvic fascia and of the muscle, and extravasation of pus into the subjacent cellular tissue? It is certain that the pus rapidly reaches the perineal region, and opens by an abscess at the margin of the anus or at a variable distance. When the collection opens we are struck by its abundance and by the fetid character of the pus, which continues to escape for a long time. The symptoms which precede the opening of the abscess are the same as the previous ones, both general and local; they undergo the same diminution after the perforation. The foreign body may be left in the upper part, and may remain there for a long time if its shape, size, and the accidents which it produces are not incompatible with the functions of the rectum. Our knowledge of the gravity of fistulæ of the superior pelvic-rectal space will explain why these abscesses recover so rarely (no doubt on account of the mobility of their walls), and why they terminate in fistulæ, which are very difficult to cure.

Perforation of the labia majora.—In the female, the pus and foreign body may pass along the lateral portions of the pelvis, and thus reach the external genital organs. In 1869 Gaillard presented to the Surgical Society the history of an intestinal concretion which had perforated the rectum and formed an abscess in the labium major. A fistula resulted, from which the foreign body was extracted. The nucleus of this concretion was composed of an agglomeration of grape-seeds.

2. Inflammatory Accidents in those Parts of the Rectum which are not covered by the Peritoneum.—The portion of the rectum included in this description extends higher behind than it does in front, on account of the presence of the meso-rectum. But this consideration loses some of its importance, because the inflammatory lesions secondary to the presence of foreign bodies are much more frequent in the lateral portions of the organ and in the ischio-rectal fossa. On account of the structure of the surrounding parts, which is extremely favorable to the development of inflammation, the abscesses produced by foreign bodies are not very rare. Sometimes they do not contain the foreign body, though it is usually found in them. They not only include pointed bodies, like nails and splinters of bone, which may be present in these suppurating cavities, but also larger bodies, such as pieces of porcelain. I have, in another place, explained their migration through the various layers of the rectum. I will now merely state that the more they descend, the more the energetic contractions of the sphincter and levator ani will favor their exit, which is usually slow and progressive.

From a clinical point of view, the abscesses produced by foreign bodies in the rectum are divided into two classes: 1, gangrenous abscesses of the ischio-rectal fossa; 2, abscesses of the margin of the anus.

1. *Gangrenous abscess of the ischio-rectal fossa.*—Almost all the foreign bodies of the rectum may furnish examples of this class, but they

[1] Th. de Pozzi, Paris, 1872: Des fistules de l'espace pelvi-rectal supérieur.

are most commonly produced by somewhat large objects, which are arrested from six to eight centimetres above the anus. They may follow a primary or secondary perforation, which puts the foreign body in contact with the fat and cellular tissue surrounding the lower end of the rectum. We readily understand that such a perforation is not confined to the first layers of the organ, and that it also involves the levator ani muscle before its fusion with the external sphincter. As soon as the body, whether organic or inorganic, which is soiled by very deleterious substances, comes in contact with the adipose tissue, an acute inflammation occurs, accompanied by the usual symptoms of large abscesses in this region, viz., fever, gastric disturbances, constipation, etc. But the most important symptoms consist of the very severe pains, which begin suddenly, and which are acute, piercing, throbbing, and continuous. A number of surgeons insist on this peculiarity. H. Larrey even believed that the extraordinary acuteness of the symptoms should put the surgeon on the track of the diagnosis, and lead him to suspect the presence of a foreign body. The existence of foreign bodies in these peri-rectal phlegmons is, perhaps, much more frequent than is generally believed, and they may be present even though we do not see them, as in cases of bones and nails, and Van Helmont's case of a thorn.

However this may be, the inflammation is frankly phlegmonous from the beginning; it often passes beyond this, and, in place of an ordinary abscess, we frequently notice the formation of a gangrenous abscess. The course of the disease is rapid in both cases, but it is especially so in the latter. Within five or six days, the entire ischio-rectal fossa becomes gangrenous, and its contents must be eliminated. Furthermore, the inflammation and gangrene are not confined to the perforated side, but they are propagated to the ischio-rectal fossa on the opposite side. Surgeons are but too well acquainted with this terrible affection, whose rapid progress is beyond the efforts of science, and which results in a dissection of the lower end of the rectum, which is separated from its connections to the tubera ischii, and sometimes hangs like the pendulum of a clock in the midst of the fixed walls of the pelvis. Such ravages have been observed after gangrenous abscesses due to foreign bodies. In less grave cases it is not infrequent to find a bluish path make its appearance at a variable distance from the anus in the midst of the engorged, œdematous tissues, which present a red erysipelatous color. This is due to gangrene of the skin, which, as a rule, does not exceed a two-franc piece in size. It is due to the propagation of the inflammation, sometimes also to the pressure of the foreign body which has been known to project in this region. There is an interesting fact to be noted in such cases, and which may also, to a certain extent, guide the treatment of the surgeon, viz., that the incisions made by the bistoury do not arrest the progress of the gangrene, and that the skin becomes gangrenous along the incision, despite the removal of the constriction, and sometimes even despite the escape of a quantity of pus.

Whether the abscess is phlegmonous or gangrenous, the same phenomena are presented as soon as it is opened either spontaneously or by the surgeon. The foreign body sometimes escapes with the pus, and may pass unnoticed if it is small and stercoraceous. Sometimes also this irregular body has itself opened the collection, and projects for several centimetres through the opening. Hévin mentions cases of this kind; in one of them, a bone, which had been swallowed by a patient suffering from hemorrhoids, pierced the rectum, the muscles, and even the skin. The

patient was led into error concerning the real cause of his symptoms on account of the presence of the hemorrhoids.

When it opens spontaneously, as is especially observed in gangrenous abscesses, the orifice which gives vent to the discharge, may be situated very far from the anus; thus it was found at a distance of eight centimetres from the anus in a case in which a chicken-bone constituted the foreign body. Hévin reports that an erysipelatous inflammation in a patient terminated in a gangrenous spot as large as a twenty-four sou piece. The foreign body, which was found to be a piece of a stone jar, was half a foot distant from the anus; the patient recovered, although gangrene of both buttocks occurred.

Very often the foreign body does not become visible immediately, and does not make its exit spontaneously, so that it must await some chance event which ends its stay. When the abscess is opened with the bistoury the abnormal sensation of a hard body may immediately reveal its presence. At other times the grooved director, which is introduced in order to measure the extent of the detachment after spontaneous opening or incision, reveals the cause of the affection. But in a number of cases the disease is treated as an idiopathic phlegmon of the ischio-rectal fossa, and recovery is not possible; one or more fistulæ appear at a distance from the anus, and continue to furnish a large quantity of pus. The exploration or the preliminaries of the operation for fistula bring the foreign body to the notice of the surgeon. The sensations of the patient are not unimportant, because, at the moment of defecation, he experiences a pricking which is not observed to the same extent in simple fistulæ. After the extraction, which does not present any serious difficulties, the fistula or abscess recovers spontaneously, unless the track of the fistula has become indurated and callous, when the affection necessitates special treatment.

Abscess at the margin of the anus.—These are distinguished from the preceding by their small size, situation, and relative benignity. In a general way it may be said that they follow the perforation of foreign bodies which are arrested in the lower part of the rectum and in the valvular folds, which form the end of the muscular columns. They are for the most part small, and confirm their mechanical origin. They include pieces of bone, small splinters of wood, pins, needles, etc.

Huguier remarked to the Surgical Society that these abscesses sometimes contain small nails, which upholsterers are in the habit of holding in the mouth, and which they swallow. Demarquay was struck by the frequency of pieces of bone in these abscesses. Like the preceding ones, they are accompanied by more severe pains than ordinary abscesses; they are also developed more rapidly, but do not produce such grave general symptoms. The local symptoms (difficulty or impossibility of defecation, very sharp pains in the anus) are alone observed, and are shown externally by a swelling, which is prominent at one point and fluctuating.

Their history is simple, because they are not complicated by extensive detachment, and give rise to small fistulæ, which promptly heal as soon as the foreign body has disappeared.

5. Phenomena of Obstruction.—Nothing is simpler than the genesis of obstruction in cases of coprostasis, as it is almost the rule, and constitutes the most serious symptom. But we may also observe it in consequence of much smaller foreign bodies, such as kernels and splinters of bone which, by uniting together, produce an arrest of the fæces, which grow progressively harder and accumulate in the rectum and sigmoid flexure.

The obstruction may present different degrees in both cases, according as it is temporary and slight, persistent or very grave.

1. *Temporary obstruction.*—Fortunately this is the usual form observed, and the symptoms are those of obstinate constipation. Thus, in persons who do not have a passage from the bowels, or only a slight one in two or three weeks, colic pains occur with tenesmus, a sensation of weight in the perineum, radiating pains in the kidneys, thighs, and genito-urinary organs; sometimes there is incontinence of urine, sometimes retention. At the same time, the general condition, without being manifestly changed, presents a large number of the symptoms of gastric derangement: general malaise, headache, furred tongue, anxious expression, anorexia, tympanitic abdomen, sometimes also eructations. Pressure upon the abdomen is very painful, especially in the left hypochondrium; walking is very distressing or impossible; the desire to go to stool is sometimes present and is very intense, and then disappears.

In addition to these typical cases, in which there are no evacuations, there are other more deceptive ones which are accompanied by alvine dejections. These stools are composed of a yellowish, mucous fluid, secreted by the intestine, and is sometimes very fetid, as in cases of white scybala. They may even be normal, when some portions of the fluidified stercoraceous mass are detached from the obstructing plug, or when the gradual dilatation produced by the accumulation permits the passage of a portion of the fæces upon one side of the canal or in the centre.

The mildest form does not go beyond this. It usually ceases at the period at which the more serious symptoms begin, either spontaneously by an effort of nature, or from the administration of the appropriate treatment; but relapses are not very rare.

2. *Complete obstruction.—Strangulation.*—The same symptoms are observed when the obstruction is persistent and serious. They only follow one another more rapidly, because complete arrest of the fæces appears at an early period. Nevertheless they may progress very slowly without manifesting very acute symptoms. It is especially in cases of this kind that chronic changes develop in the rectum, and may lead to error with regard to the real cause of the symptoms.

All stercoraceous tumors generally have a period of indolence, during which they form, increase, and harden without preventing the discharge of the fæces, which is only somewhat interfered with. These symptoms do not become acute until the last period, when the intestinal masses, containing dry or semi-doughy substances, form a long half-crown, which mounts up into the sigmoid flexure, the various parts of the colon, and sometimes even into the cæcum.

All the symptoms which result from the obstruction are either : *a*, mechanical ; or *b*, inflammatory.

a. *Mechanical symptoms.*—I do not insist upon the accumulation of fæces, which is sometimes truly extraordinary. The rectum, as if worn out by the weight of such a heavy column, is weakened or displaced. It is not infrequently found to be inclined laterally, and the sigmoid flexure, being curved forward, projects upon the lateral parts of the bladder, where we can feel an irregular, hard tumor, which is very slightly movable, the latter being an important characteristic and often enabling us to diagnose the affection. This phenomenon is especially manifested when the obstacle to the advance of the fæces is situated somewhat high up, above the superior sphincter, to which O'Beirne attributed, and not without reason, a very important part in rectal physiology and pathology.

There is, in reality, a difference of action according as the obstruction exists above or below, and the circulatory disorders in the organ are much less appreciable in those cases in which it is more elevated. Thus the swelling of the perineum and anus, and the turgescence of the hemorrhoidal tumors are less marked. This is also true of the urinary disorders, which are less immediate and intense. We very frequently find that foreign bodies introduced into the anus produce the same result when they have been pushed high up by the manipulations of the patient or the spasmodic contractions of the levator ani muscle. In this case the foreign body leaves the rectal pouch and obstructs the intestine at a somewhat higher part.

If a foreign body of stercoraceous or other origin exists in the rectal pouch, the indolence may persist for a longer time, as this dilatation is capable of assuming surprising dimensions. It is not rare to find that authors speak of concretions larger than a fœtal head. We can form a correct idea by glancing over the varied series of objects introduced. If we also add the forceps, which must sometimes be introduced, we can judge of the elasticity of the rectal pouch under certain circumstances. The disturbances due to the accumulation of fæces develop none the less, and are evinced by dysuria, tenesmus, painful straining often produced by the venous stasis and hemorrhoids ; at the same time the perineum becomes swollen. In the female the tumor projects at the posterior wall of the vagina, and, if the uterus is gravid, it may obstruct its development and produce various accidents, a very interesting specimen of which is found in the Bulletins de thérapeutique for 1857.

Observation.—Abortion produced by a stercoraceous tumor.—Invagination of the rectum.—In 1845 I was called by one of my dispensary patients to stop a flow of blood which had lasted since morning. The patient was a young woman, twenty-four years old, who had been married for six months, and had suffered nothing beyond the results of an obstinate constipation. She told me that she was two and a half months in the family way, and that three days previously she had been present at the wedding of her sister, who lived in a small village in the environs of Paris. In the night following the ball, at which she had danced and waltzed a great deal, she suffered from colic, followed by disturbance of the bladder. These symptoms having completely disappeared on the following day, she returned to Paris in a wretchedly constructed carriage. Under the influence of the jolting the uterine pains returned as soon as she came home, and continued during the entire night, accompanied by a loss of blood, so that she feared the production of an abortion. I practised the touch, and was not a little surprised to find a tumor entirely filling the vagina; it was with great difficulty that my finger could reach the neck and seize the fœtus, together with the remnants of the ovum which had fallen into the cul-de-sac behind the tumor.

Oily enemata were discharged again in the same condition in which they had been injected; purgative enemata, soap-water, and a drastic produced no effect. The fact that the enemata were injected and voided so freely, and that numerous evacuations following the use of purgatives had produced no diminution in the stercoraceous tumor, led me to make a direct exploration. The finger, carried into the rectum, enabled me to detect a mass of hardened fæces, in the centre of which the fluids of the stools had hollowed out a very large canal. But the most remarkable fact which I noticed was the disposition of the rectal mucous membrane around the opening of this canal. The inner membrane of the intestine formed a sort of prolapse, and the membranous fold, descending into the interior of the canal, which was hollowed out in the fæces, prevented the fluids coming from the upper parts of the intestinal tract from penetrating between the tumor and the walls of the rectum.

This arrangement of the parts showed me that mechanical interference alone could relieve the patient. I armed myself with a grooved wooden spatula, and, with the aid of this instrument and then of a jet of soap-water thrown by an irrigator, the canula of which was placed in the rectal pouch, I soon succeeded in relieving the patient.

The use of bran bread and the daily employment of saline enemata prevented the return of any accumulation. (Bull. thérapeutique, 1857, T. 53.)

Fournier[1] observed an analogous case.

Finally, a frequent mechanical accident is the compression of the sacral plexus by the tumor, the usual effect of which is the production of pains in the kidneys, loins, and lower limbs. They may be so severe as to prevent the patient from walking, and they present a peculiar characteristic, viz., that the patients may partially relieve them by strongly pressing upon the anal region, which diminishes the compression, or by lying upon the side.

Functional symptoms. 2d period.—The functional symptoms begin with the obstruction, but they grow rapidly worse as the fæces accumulate; they are either general or local. I will not speak of the latter, which are the results of the mechanical compression. The general symptoms are at first slight, as in temporary obstruction, consisting of gastric derangement, loss of appetite, flatulence, tympanites. In confirmed obstruction these symptoms are increased by a slightly icteric, sallow hue; the face is pinched, the eyes sunken. The emaciation of the limbs makes terrible progress, while the abdomen becomes very tense and filled with gas, which passes back into the stomach and œsophagus under the form of very fatiguing eructations. The pulse is usually unchanged, and is slow and filiform rather than febrile. During this period the patients are obliged to lie down, because walking is very painful, and their weakness, resulting from the digestive disturbances, is extreme. These symptoms may continue six or eight days, but it is very rare that inflammatory symptoms do not make their appearance at this time. In cases possessing this intensity the affection may have a fortunate issue, though this is not always so. The mechanical obstacle must be suppressed, and, in order to do this, surgical interference is usually necessary. We should rely very little on the hope of spontaneous recovery, and the treatment should be active and rapid, because it may be very effectual at this time, while, during the third stage, it is powerless in the large majority of cases.

b. *Inflammatory symptoms. 3d period.*—I have previously stated that they may appear earlier or later, according to the gravity of the affection. In reading the observations reported by authors, we find these symptoms described under various names. Some say that the affection terminates in ileus, others in strangulation. All these terms are inexact, and it is unnecessary to discuss them. At a given time the adjacent tissues and the intestine itself react on account of the exaggerated distention and of the infiltration of the walls at the site of the obstruction. A small perforation may even occur at one point. However, the pathological sensitiveness of the peritoneum is so great that the mere obstruction will suffice to explain the production of inflammatory phenomena. These symptoms have been described under the head of foreign bodies in the intestines, and I refer the reader to the corresponding chapter. It will suffice to say that fever develops, that hiccough and vomiting appear, at first mucous and alimentary, then bilious and poraceous, finally stercoraceous. The meteorism becomes extreme, the distended belly is painful on pressure. There is sometimes slight ascites, and we may observe the symptoms of localized peritonitis in some cases. The symptoms usually keep on increasing, and death occurs within a few days, before pus can be formed in the peritoneal cavity.

But the symptoms are not always so precipitate, and remissions sometimes occur, which impose on the patient and may even deceive the sur-

[1] Cas rares: Dict. en 60.

geon. There is nothing more variable than the termination of this third stage, which is either indolent, or accompanied by very painful paroxysms, and sometimes by delirium and convulsive disturbances. Upon autopsy the examination of the viscera shows the existence of an enormous accumulation of fæces above the organ, which is so much greater the longer the affection has lasted. At the site of the obstruction the rectum is either very much distended or very thick and adherent to the adjacent viscera by infiltrated false membranes which are bathed in a sero-purulent, always opaque fluid. In certain spots the walls of the rectum and sigmoid flexure are black, from the presence of semi-gangrenous patches, which are readily detached. Side by side with these spots of softening, there are other harder ones, which are almost fibrous and result from old thickening of the intervisceral cellular tissue.

May the affection terminate fortunately even at this time? I have found no example of such a termination, but I think it may occur if a circumscribed peritoneal phlegmon forms which opens externally and produces an artificial anus. Nevertheless, what nature can do has been attempted by the surgeon in those cases in which the cause was unknown or unappreciated. He has cut through the walls of the abdomen in the search for the obstructed part of the intestine. Such interference is unjustified except in extreme cases.

CHAPTER V.

DIAGNOSIS.

The diagnosis of foreign bodies in the rectum may be either very easy or very difficult, and is sometimes even impossible. It is easy when the patient can furnish information with regard to the origin of the affection, when he states that he has swallowed some foreign body with his food. It is, on the contrary, very embarrassing when the history is wanting, or when the patient wilfully deceives in order to avoid the shame of a confession. Finally, it is almost impossible, if no primary symptom puts us on the scent of later complications, such as abscess, etc. Side by side with the vague indications furnished by the patient, we must place the numerous chances of error which prevent the surgeon from discovering the truth. When we reflect upon the existence of previous hemorrhoids, especially in old people, upon the repugnance of certain individuals to speak of this region and to permit examinations (which are sometimes refused), if we finally consider the variety of symptoms, the sympathetic disorders of the genito-urinary organs, etc., we will understand why the list of mistakes in diagnosis is so large. There is not a disease of the adjacent organs, nor a neoplastic or other growth, which has not been mistaken by eminent practitioners for these cases of foreign bodies or stercoraceous tumors. Thus they have been mistaken for tabes mesenterica, splenic or uterine tumors, prostatic affections, enchondromata, sarcomata, and carcinomata. I will report an excellent illustration,

which I copy from Jobert, and which is remarkable for the composition of the tumor:

Observation.—Stercoraceous tumor mistaken for cancer.—The woman who was the subject of this observation consulted Dr. Richerand for a supposed cancerous affection of the rectum; at least this was the view adopted by the physicians whom the patient had consulted in her own country. They could not have been deceived by the words of the patient, for a long consultation had clearly revealed all the symptoms from which she had suffered, and was terminated by the phrase, "a carcinoma, *nostra est sententia.*" The professor whom I quote then made the patient describe her symptoms, and the woman's story raised some doubts in his mind as to the cancerous nature of the affection. She stated that she experienced a feeling of weight in the fundament, that she often suffered from expulsive contractions which were not followed by any discharge of fæces, and that the pains were propagated to the thighs and accompanied by numbness, indicating compression and not a cancerous affection, which is characterized by darting and intermittent pains. She suffered from insomnia; she complained of a tendency to vomit and complete distaste for all food, so that she had emaciated and the entire surface of the body was yellowish. This was supposed to be the effect of the cancer, but it proved to be merely the result of the absorption of bile. This unfortunate would probably have died from inanition or inflammation of one of the abdominal organs. if an expert hand had not come to her relief. Richerand, after having paid careful attention to the story of the patient, in order to make sure, introduced a finger into the anus, explored the cavity, and soon found an intestinal calculus. He then adopted energetic surgical measures instead of the medicines prescribed by the previous physicians. The patient being placed on the edge of the bed and one thigh flexed on the pelvis, he began by incising, with the aid of a probe-pointed bistoury, the posterior part of the anus toward the coccyx, after which he introduced a kind of curette, dipped in oil, between the walls of the rectum and calculus. He then extracted the latter, but was obliged to break it into several pieces, as it had attained a considerable size. He prescribed potions and enemata of oil. The edges of the wound came in contact and cicatrized, the appetite returned, the surface of the body resumed its natural color, sleep returned, and the patient was soon entirely restored. Thus a positive diagnosis and rational treatment relieved this patient of an affection from which she had been suffering for six or seven months.

The analysis of the calculus proved that it contained albumen, a blackish substance, phosphate of lime, vegetable débris, and a small amount of bile. The calculus was large; externally it was of a whitish color and covered with bloody mucus; internally, and when cut through the centre, it was composed of three concentric layers; the central one was white and enclosed the bone of a bird and a small stone of carbonate of lime, these different substances being scattered through the white matter; the middle layer was green and contained fruit-pits; the third was gray. These layers were separated very sharply from one another. (Jobert: Mal. chir. du canal intestinal, T. I., p. 114.)

In a case quoted by Gibert,[1] all the usual symptoms of the accumulation of stercoraceous matters were attributed to hemorrhoids. Leeches to the anus, sitz-baths, enemata of oil and milk as nourishment, were prescribed. Exhaustion occurred with low fever, and expulsive pains developed every moment, which produced the discharge of a yellowish, stercoraceous fluid in very large quantities. A very tardy exploration revealed the presence of a hard, large stercoraceous plug, the extraction of which relieved the patient. The diagnosis is more difficult in cases of stercoraceous tumors, as the patient presents more sharply defined symptoms when foreign bodies have been swallowed or introduced. Individuals who have introduced foreign bodies into the anus do not usually consult the surgeon until they have reached the limits of their endurance, and then the mere indication of the accident puts us on the track of the foreign body. But if, as we have seen, on the other hand, they conceal their history, like the convict who introduced the *nécessaire*, or the peas-

[1] Arch. gén. de méd., 1827.

ant whose rectum and colon were filled with snails, then the diagnosis will be erroneous for a long time until some circumstance enables us to fix it more positively.

Perhaps, by insisting upon the possibility of these mistakes, they will become less frequent in the future. I have already stated that even Nélaton was mistaken in a case of stercoraceous tumor; a formidable evacuation fortunately terminated a supposed nephritis. An old man, who had an obstruction of the rectal pouch produced by dry beans, had urinary symptoms of which he died. The true cause of death was only determined on autopsy.

It sometimes happens that rectal touch leads us into error. Some authors, Choffard among others, have observed cases in which touch led to a recognition of considerable thickening of the rectum, with narrowing of the diameter of the intestine. It was thought that the lesion of the intestinal canal was secondary to an organic affection, and no notice was taken of the real cause.

These considerations are extremely important, because not alone the treatment, but also the very life of the patient, depend upon them. If we entertain the idea that the affection is due to an organic tumor, death will occur within a short time from obstruction or perforation. If we form a correct diagnosis or acknowledge a mistake, as Lisfranc had the good fortune and honor to do, we may save the life of the patients in the great majority of cases. Unfortunately, autopsies do not always clearly demonstrate the error committed, because the intestinal lesions which are observed, and which are caused by the stercoraceous tumor, greatly resemble neoplastic infiltrations.

The elements in diagnosis are:

1. The previous history.
2. The subjective symptoms.
3. The objective symptoms.

1. *Previous history.*—The previous remarks will suffice to teach us the importance of the previous history. But if the patient cannot or will not give us any information, we must use all the sagacity at our command to call forth answers or to force the patients to make a confession. After having drawn attention to their diet and previous meals, the patients will often remember having swallowed a bone, a pin, etc. Others complain of obstinate constipation, the presence of numerous scybala in their stools, etc. We may thus, by earnest questions, clear up an obscure diagnosis. Finally, it is a general rule, from which we should not depart with regard to these unfortunates, that shame prevents them confessing their story. We should patiently listen to all the information which they give, without trying to intimidate them by incidental questions, without allowing them to notice that we are not deceived by their explanation. Sometimes, when the patients do not wish to confess before witnesses, it is well to interrogate them separately, and to endeavor to inspire them with confidence. It was the fear of punishment which hindered Closmadeuc's convict from confessing the introduction of the *nécessaire.* Sometimes, when overcome by pain and the fear of death, they confess their misdoing to an attendant. As a general thing, the importance of the history is so great that we should endeavor to obtain it by all possible means. When a foreign body has been introduced, it is well to have a similar object shown to us. This is always a source of useful therapeutic indications, in case the object is irregular, like a wooden hook, for ex-

ample, the simple extraction of which would be more dangerous than useful.

2. *Subjective symptoms.*—These are the ones which are first presented to the surgeon, and which may easily lead to error, from the fact that they are common to a large number of affections. All the symptoms are local, and there are none which have a real value in all cases, except the pain which patients suffer in going to stool. If this pain is piercing, and situated somewhat deeply, there are some reasons to suspect the existence of a foreign body. On the contrary, the difficulty of defecation gives rise to a precise indication, which Bœckel formulated in the following manner: *we should always perform the rectal touch when constipation has existed for several days.*

We should mistrust the other symptoms occurring in the vicinity, the urinary disorders, for example, because they deceive more often than serve us. How often have old coprostases been treated as affections of the bladder or the prostate, and so much the more as the two diseases often co-exist and increase reciprocally. This is also true of uterine affections of a strange nature, which are always painful and simulate deflections of the organ, but are merely the consequence of an accumulation of fæces or scybala.

3. *Objective or palpable signs.*—These alone have a real value, and lead us to a rational treatment. We should feel the foreign body, and for this purpose must practise the rectal touch with the finger when possible, and with instruments when the finger is not long enough. The first part of this precept always holds good, and the omission of the second daily leads to the most deplorable results. But I will again refer to this point. Rectal touch is such a simple manipulation that it does not need any description. It furnishes indications of various kinds:

1. Concerning the presence or absence of a foreign body in the rectal pouch alone.

2. Concerning the presence of fæces in the pouch, a matter which is not immaterial in cases of obstruction.

3. Concerning the form and shape of the foreign body when it does exist; nothing can replace the finger in this respect.

4. Concerning the precise situation, the connections and relations of the rectum with the foreign body. In this manner we judge of the perforation of the mucous membrane by the foreign body, of the situation of the body in some irregular fold or blind excavation of the organ or above a stricture.

5. If the foreign body is no longer in the rectum, but has passed into the surrounding tissues, digital exploration, by giving rise to a sharp pain, will put us on the track of the diagnosis. In a word, we will determine why the foreign body is arrested.

These considerations testify to the importance of digital examination. But in cases in which it furnishes negative evidence, and there is some reason to suspect a foreign body or some deep-seated affection, we must explore the rectum with the aid of a speculum and of an instrument which enables us to reach the higher parts. Even in the simplest cases, the use of the speculum, if it is tolerated, as does not always happen, is very advantageous. An excellent instrument for exploration of the rectum is the œsophageal sound, which is sufficiently supple and soft to avoid injuring the walls, and sufficiently resisting to transmit the sensation of contact to the hand of the surgeon. However, all bougies may be used in such cases if they have been previously oiled. This

exploration is very useful, as it enables us to recognize positively the existence of a foreign body in the rectum, which would not even impart the sensation of very narrow stricture. Furthermore, the instrument will bring away pieces of hardened substances, which may clear up the question. Finally, the mobility which may be observed, upon impressing slight movements upon the tumor, will establish the differential diagnosis from enchondromata or solid tumors of the pelvis, which are fixed and very often sessile.

Palpation of the abdomen gives good results in some cases. It enables us to explore the pelvis and sigmoid flexure, and it is especially indicated in conjunction with explorations made in the rectum. The existence of a hard, nodular tumor, which is slightly movable at the bottom of the left iliac fossa, is a classical sign of obstruction of rectal origin. Unfortunately it can only be used at rare intervals, because the meteorism and pain render its detection difficult. It is well not to attach too much importance to the softness of the tumor of the sigmoid flexure, which, according to the authors, retains the impression of the finger. This would be an excellent diagnostic sign if it were not very frequently wanting. I have seen it absent in cases in which the sigmoid flexure formed such a hard, nodular, slightly compressible projection under the abdominal wall, that an enchondroma of the pelvis was diagnosticated. Mobility is a more valuable sign.

Palpation is especially necessary when large foreign bodies have been introduced into the rectum. It enables us to discover the exact position of the bodies and to understand their sometimes very peculiar course, which is hardly explained by the anatomy of the parts. Clubs and bottles, by straightening and forcing the curves, have been known to project in one or the other hypochondrium, and, in such cases, palpation renders useful services which will guide us in the choice of the proper treatment. In the case of the *nécessaire* of Closmadeuc's convict, palpation enabled him to recognize, in the descending colon, the presence of the foreign body, which had not been detected either by the finger or forceps. Percussion may also be a useful aid.

It now remains to mention a certain number of minor manipulations which may lead to the discovery of the foreign body. All depend upon the touch, and refer to peri-anal or peri-rectal abscesses or fistulæ. The grooved director, introduced into a fistula or bottom of an abscess, has often made known the cause of the persistence of the affection, by coming in contact with a foreign body, a bone, nail, etc. In the same way, a bistoury, in incising an abscess of this region, or the canula of a syringe in the old method of administering enemata, has accidentally revealed the cause of the symptoms. These measures must not be neglected, and may be regarded as necessary in exploring abscesses and fistulæ. Finally, we must mention a manipulation which was extolled by a German surgeon some years ago, and which, despite the slight favor which it received in France, may be useful in certain cases. I refer to manual exploration of the rectum according to the method practised by Simon, of Heidelberg. It is indicated in those cases in which the finger furnishes no information, and it will replace mediate exploration with the aid of the sound. I have had occasion to employ this method, and I think it is capable of being applied to the exploration and extraction of foreign bodies. The hand is smaller than the two blades of a pair of forceps, and it acts intelligently. Furthermore, the same manipulation will permit both exploration and extraction. Moreover, several English

surgeons have become extreme partisans of this plan, and, despite the opposition of some authors, it presents great advantages.

CHAPTER VI.

PROGNOSIS.

The prognosis of foreign bodies of the rectum is usually favorable and the life of the patient is rarely endangered. Nevertheless there are a certain number of circumstances which aggravate it. Thus, all other things being equal, foreign bodies which are situated in the upper part of the rectum are more serious than those in the lower part. This fact is sufficiently explained by the previous considerations.

In the same way, the size, irregularity, roughness, number, and longer or shorter period of arrest, give rise to infinite variations in the prognosis. The nature of the substance which composes the foreign bodies also has an influence upon the gravity of the affection, and explains the classification, made by certain surgeons, into fragile or resisting bodies. The hemorrhages and perforations which fragile foreign bodies may produce account for this difference.

When stercoraceous tumors are symptomatic of an organic affection of the intestine, they are more dangerous than when they occur accidentally, because the persistent cause produces relapses, which may, at any moment, prove injurious and even fatal.

CHAPTER VII.

TREATMENT.

This chapter is naturally divided into two parts, which comprise: 1, prophylactic treatment; 2, curative treatment.

1. Prophylactic and Palliative Treatment.—This only applies to stercoraceous tumors and concretions, and includes general and local indications. The first refer to the regimen, which should be chiefly vegetable and not rich in fæculent substances. Individuals who are predisposed to coprostasis must adopt a special diet and watch the intestinal functions with great care. It is hardly necessary to indicate all the infinite precautions which enable us to attain this end, and which are realized by a very extensive hygiene. The local indications consist almost entirely in the moderate use of sitz-baths and enemata, which may prevent all accumulation of substances in the rectal dilatation. What course should be pursued in cases in which we fear a relapse, such as not infrequently happens? In addition to the preceding measures, some authors recommend the administration of a certain number of medicines and topical remedies, which possess no other merit beyond that of reviving the continual solicitude of these patients with regard to the condition of their rectum. Among the number of these drugs, we must mention ergot, given in doses of one or

two grammes, tincture of nux-vomica (ten to fifteen drops in water), etc. I think that these remedies should not be used until after the administration of mild purgatives, such as pills of podophyllin, which have the advantage over many others of establishing regular defecation without causing subsequent constipation. Finally, the employment of an ano-buccal electrical pile, applied locally, has been praised in some cases of paralysis to remove the atony of the intestinal walls. I do not wish to pass over in silence the daily introduction of suppositories, so extensively used in ordinary practice, and which, despite the praises of some authors, possess no very evident utility. Only a few years ago, Nagel[1] recommended the employment of gelatine suppositories in coprostasis. They require for use a previous maceration for twelve hours in water, and are introduced softened and swollen. Their action is not more beneficial than that of soap or simple suppositories.

2. Curative Treatment.—The curative treatment of foreign bodies of every description comprises one method, viz., extraction. All the efforts of the surgeon should tend to this end, but he can only fulfil this indication by modifying the general method according to circumstances. Thanks to numerous publications, we can rapidly throw a glance over all the very ingenious methods which we should know, as we may be called upon to use them at any moment. But I first desire to point out the line of conduct to be followed in simple cases, that is to say, in the majority, whether we refer to foreign bodies, properly speaking, or to stercoraceous tumors and concretions.

Preliminary precautions.—The existence of a foreign body being recognized by the touch, it is proper, before performing extraction, to take a certain number of precautions which will facilitate the operation. The rectum and bladder must be emptied by means of lukewarm, emollient, sometimes disinfectant, injections.

Which is the best position to give to the patient? Boyer advises that, in extracting stercoraceous concretions, the patient be placed on his belly upon the edge of a bed, the legs pendent, in such a manner as to light up the region as much as possible and to facilitate the final manipulations. Some prefer the cystotomy position; others, finally, prefer the classical position for operations on the rectum, one limb being extended in lateral decubitus, the other being flexed forcibly upon the pelvis, and the buttocks separated by the hands of an assistant.

If we have reason to fear an extreme sensitiveness on the part of the patient, or apprehend difficulty in the extraction, we should give the patient the benefit of previous anæsthesia.

§ 1. Treatment of Coprostasis.

The first necessity in a case of coprostasis is to administer laxatives by the mouth, and enemata by the anus; these simple measures often prove successful. We insist on these remedies, but must adopt a different plan as soon as they prove ineffectual; the following precepts, relative to their extraction by the natural passages, are then applicable. The various measures to which the physician may resort do not all possess the same value, and do not answer the same indications. Some are preferable when the tumor is small, movable, and low down; others, on the contrary,

[1] Allg. Wien. Med.-Zeit., April, 1873.

when it is large, hard, and fixed. I will discuss their special application separately. All of them demand certain precautions, viz.: 1, the previous dilatation of the anus, which is usually very firmly contracted (the fingers or a dilator fulfil this indication); 2, whatever the method employed, we should foresee the expulsion of the fæces which have accumulated above the stercoraceous plug, have something ready to receive them, and place ourselves under cover at the period of the discharge, which deluges everything around.

1. *Simple extraction with the fingers or forceps.*—This operation is performed without using the speculum; the index finger of the left hand, previously oiled, is introduced into the rectum; then a pair of flat-bladed forceps, preferably worm-screw or lithotomy forceps, are passed along upon the finger. When the foreign body is in contact with the finger, the right hand of the operator opens the blades of the forceps and seizes the concretion, which the left index finger has kept immovable. Extraction is then performed. This is the simplest procedure in cases of movable foreign bodies situated within reach of the finger, and sufficiently narrow to allow the action of forceps. Some surgeons prefer to use the speculum, which is fixed after it has been opened, and which enables us to see what we are doing.

2. *Extraction of a large fixed concretion situated high up.*—Whenever the foreign body is beyond the reach of the finger, we must abandon the previous measure, use a speculum, and reach the concretion with the aid of instruments which are carried to it by means of an ordinary gorget. The operator then endeavors to seize it by means of strong, narrow and long forceps. He sometimes succeeds in this manner in withdrawing the concretions, which must be rendered movable by tractions in every direction, as in the use of forceps for delivering the fœtus. Warm injections of oil, recommended in such cases by Birket, render useful services as an adjuvant. If we cannot seize the mass or render it movable, on account of its size or fixity, we must resort to other measures, the object of which is to produce fragmentation of the tumor. It is performed with the aid of a long and harmless body, which is introduced through the speculum in contact with the tumor. A large number of instruments may be used for this purpose; spatulæ, the handle of a spoon, a gorget, the blade of a forceps, a piece of wood, are those which are most often at hand in such cases. The operator scrapes the tumor, and endeavors to break it by means of one of these instruments, being aided also by the action of a jet of warm water constantly thrown by an irrigator. The concretion, being thus hollowed out little by little, finally breaks into pieces, and a somewhat prolonged irrigation usually leads to an evacuation. The operation must be performed in the manner indicated, but we must not be in too great a hurry and must use patience in order to prevent injury to the parts. If we discover that the action of the spatula fails, as will occur when the stercoraceous tumor is stony and very hard, we must desist from its use and resort to other methods. Some surgeons have employed, for this purpose, multiple forceps and strong extractors, in order to grind or divide the principal mass; some authors also advise the use of lithoclasts. It is only in rare cases that we can operate through a speculum with sufficient freedom to perform the latter manipulations. Boyer also advises that if the dilatation attained with the aid of the speculum is insufficient, the anus and its sphincter be divided in one or more directions. (Mareschal: Mém. Ac. de chir.)

Finally, we must remember that the introduction of the hand has al-

lowed the fragmentation of the tumor and relief of the strangulation. This plan will be of service in some cases. It may be preceded by enemata of Seltzer-water pushed up as far as possible with the œsophageal sound. (Prunac, 1878.)

To resume: Extraction by means of forceps is the rule in the majority of cases; fragmentation and injections in others. Although the surgeon can always extract these concretions, he must not forget that this operation may present serious difficulties, and that it may be followed by accidents when the manipulations have wounded the rectum.

§ 2. Foreign Bodies, properly Speaking.

In simple cases, that is to say, when the foreign bodies are small, solid, and do not present any irregularities, we should extract them with the aid of the fingers and forceps after the sphincter has been dilated, as Alibran did in order to remove a piece of wood, thirty-two centimetres long, after he had failed to do this with the hand. This is a general rule, applicable especially to those bodies which have been introduced through the mouth, like coins, fruit-stones, etc. Even simple displacement with the finger may suffice to put a stop to the symptoms and causes of arrest. Swallowed bones which have lodged in the rectum have thus become inoffensive from simple rectal touch.[1] It is only in exceptional cases that simple enemata suffice to remove the foreign body, as in Bœckel's case.

But we can rarely utilize it when the foreign bodies have been introduced into the anus; and, as these bodies often do present very large and peculiar shapes, I have thought that it would be useful to group together the various cases which may present themselves, in order to guide the physician in the midst of the infinite varieties of practice. With the exception of the simple cases which need no special mention, we may classify all foreign bodies introduced into the rectum into three groups:

1. Large foreign bodies, either fragile or solid.
2. Regular and pointed foreign bodies.
3. Irregular foreign bodies.

I. Large Foreign Bodies.—These may be fragile or not; this division is extremely important from a therapeutic point of view, as the treatment must be very different in the two cases.

1. *Large and fragile foreign bodies.*—These usually include bottles of all sizes, glasses, tumblers, stone jars, preserve-jars, lamp-chimneys, etc. One indication predominates over all the others, viz., that we must, as far as possible, avoid breaking them, because this gives rise to serious hemorrhages and sometimes to fatal perforations. Moreover, they are difficult to extract whole, because they are easily broken by forceps or other instruments, which glide over them. Finally, if the attempts at extraction fail, they almost always push the foreign body in further, where it enjoys a certain amount of mobility.

The measures indicated in such cases are:

A. *Simple extraction with the fingers after dilatation.*—J. Cloquet succeeded in this way in removing a drinking-glass from an individual's rectum.[2] He made a preliminary dilatation with the aid of his fingers. We can form an idea of the degree of dilatation necessary in such cases from

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[1] Bulletin de thérapeutique, 1844, T. XXVI. [2] Soc. médico pratique, 1864.

the fact that Cloquet employed fourteen fingers in order to obtain sufficient distention of the anus. In this case the foreign body was expelled by the patient's own efforts. It is proper to ask whether the surgeon may use inflexible wires which he can employ as levers if the fingers are useless in such a case. In this way Buzzoni removed a coffee-cup by means of a busk of whalebone. Forceps are usually the first instruments employed, but they are often useless in those cases in which the foreign body is broken. Nevertheless it is well to try them, covering them with cloth in order to make them adhere better. They must be introduced along the finger; some authors recommend the simultaneous employment of three or four forceps applied at various points. Dilating forceps, like those used in tracheotomy, may be of great service in cases of long-necked bottles. They are introduced closed into the neck and are opened in the interior; the following observation is curious from this point of view:

Observation.—A young man had introduced a bottle of cologne-water into the anus for a purpose which he would not disclose. Ordinary measures being useless, a dilating forceps was introduced into the neck of the bottle, which permitted the ready withdrawal of the foreign body.

If the foreign body occupies this position, it would also be useful to carry a slip-knot around the neck of the bottle, which can then be easily withdrawn.

B. *Extraction with forceps.*—In addition to ordinary forceps, we must mention the obstetric forceps, which have been employed more than ten times in extracting large, fragile foreign bodies, such as bottles and glasses, from the rectum.

Observation.—Extraction with forceps (Cumano: Gaz. méd., 1838).—"A patient had introduced into his rectum a glass bottle, measuring two inches in its longest diameter, the neck being above. Attempts at extraction only pushed it further into the rectum. Cumano found the foreign body situated in the hollow of the sacrum, and he could barely reach it with the index finger. He extracted it with the aid of Boër's forceps. He placed the patient in position, introduced his hand into the rectum, and, by its aid, applied the first blade of the forceps against the neck of the bottle. He did the same with the other blade, articulated the instrument, and then tied the two blades high up with a cord. The bottle was withdrawn without being broken."

We ask, with the editor, why this surgeon, having his hand in the rectum, did not remove the bottle by simply pulling it out?

Velpeau, Nélaton, Désormeaux, Laroyenne, Fano, Lefort, have reported cases of this kind. Successive attempts have not been very beneficial, as Nélaton's patient had a hemorrhage on account of the glass having been broken, and Velpeau's case died of a pelvic phlegmon. However, the more recent cases of the application of the forceps are more fortunate, and Désormeaux, among others, succeeded when all other plans had failed. He thus removed a bottle nineteen centimetres long, which was filled with stercoraceous matter. His patient recovered.

Siredey has published, in the Bulletins de la Société anatomique, 1858, a case of extraction of a bottle twenty centimetres long and nine centimetres in circumference, with a pair of forceps.

The blades of the properly oiled forceps are introduced separately, with or without incision of the sphincter; they are then articulated.

It has been advised to cover the inner portion with linen in order to avoid wounding the rectum in cases in which the foreign body will

be broken. The advice is undoubtedly good, but perhaps not capable of practical application. In all cases I think that we should choose the smallest forms of forceps in order to avoid dangerous ruptures. If possible we should also imitate Lefort's plan, who first poured some plaster into a beer-glass and then extracted it without danger.[1]

C. *Extraction by means of hooks.*—Hooks have been useful in some cases in withdrawing bottles or glasses, but they usually require a previous perforation of the foreign body, and should, therefore, not be employed except as extreme measures, because they expose the patient to danger. Pollok[2] has reported a case of extraction by this method. The foreign body was a large champagne-bottle, which could not be extracted until a month after its introduction by perforating it with an iron wire and then withdrawing it by means of a hook.

D. *Extraction with the hand introduced into the rectum.*—This method is not a new one, as Nolet has reported a very striking example of it, which was quoted above.

Another analogous method is employed in medicine, and this procedure is very rational. The surgeon may use the hand with as much propriety as the forceps in order to extract the foreign body, at least in order to place hooks in position which will permit extraction.

E. *Fragmentation of the foreign body.*—When the previous plans have failed, there is no other alternative than that of breaking up the foreign body or of abandoning it. Despite the dangers to which fragmentation exposes the patient, it is nevertheless useful, especially if we regulate it and take the precautions necessary to render it as inoffensive as possible. It is performed in different ways, according to circumstances and to the ingenuity of the surgeon. Velpeau used with advantage a piece of shoe-leather, which he introduced between the broken object and the mucous membrane in order to protect the latter; we should always follow his example. Moreover, a large number of other flattened objects will subserve the same purpose.

The rectum being sufficiently protected, how shall the object be broken? The authors who have had to deal with cases of this kind are not very explicit, and it appears to me to be often very difficult of performance. I believe that it is rather an accident, which occurs when we least expect it during other methods of extraction. The employment of the cephalotribe, which was employed in Parker's case, appears to me to be full of danger. The use of strong forceps, obstetric forceps, etc., may prove successful. Manunta employed a lithotrite in order to break a coffee-cup, which a young student had introduced into the rectum.[3]

The use of iron wire, which one unfortunate employed in order to break and extract a carafe from his rectum, is always attended with too much danger. It is rare that fragmentation does not produce some hemorrhage, which must be combated with cold irrigations, the introduction of a tampon, or the use of styptics, if necessary, as in the case quoted by Parker.

Observation (résumé) by Parker.—A glass cup extracted from the rectum.—"On the afternoon of March 1, 1848, a young man consulted Parker with regard to his father whom he had brought into the hospital. After beating around the bush and manifesting considerable shame and embarrassment, he stated that his father, named Loo, who was sixty years old, had passed the previous night in a house of prostitution.

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[1] Malgaigne: Méd. opér., revue par Lefort. [2] Méd. Press., 1869.
[3] Velpeau: Méd. opér., T. II.

Overcome by drink and opium, this old debauchee conceived the strange notion of pushing a goblet, two and a half inches in diameter and three and a half inches long, into the vagina of his partner. During the night, while Loo was completely intoxicated, the woman attempted to revenge herself. She carefully introduced the bottom of the goblet into the rectum, placed the end of the opium pipe, which was a foot and a half long, into the goblet, and pushed it into the rectum. The goblet disappeared and had been retained for twenty-four hours. A piece of the edge, about half an inch long, had been broken off by the friends in attempts at extraction. The glass was firmly fixed and it was very difficult to pass the finger between it and the rectum. Parker, determining to break it, employed a cephalotribe and removed it in pieces, taking care to protect the parts with cotton. The most difficult part was the extraction of the bottom of the glass, which was very irritating. It was done, but not without difficulty, by making it see-saw from side to side. Considerable hemorrhage occurred, which was arrested with sulphate of copper and alum. The man recovered in two weeks." (Amer. Jour. of Medical Sciences, 1849, T. XVII., p. 409.)

Operations necessary to assist extraction.—If extraction by any of these plans is rendered very difficult on account of a constriction or of abnormal contraction or swelling of the sphincter, we should not be afraid of making a longitudinal incision on the wall of the rectum posteriorly. This advice had been given by Boyer and Jobert, and has been carried into practice for a long time by Richerand and Raffy.

Observation by Raffy.—A forked foreign body introduced into the rectum, and extracted on the 18th day; recovery (Gaz. hebd., 1860, p. 509).—"The patient in question had suffered from intermittent anal hemorrhage for about twelve days. If his statement is to be believed, the hemorrhage followed a strain. When Raffy saw him, Sept. 26, 1858, the hemorrhage continued very profuse; the patient was in a condition of extreme anæmia, and suffered the most violent pains in the anus and rectum. He stoutly denied having swallowed a foreign body or having introduced one into the rectum. The sphincter ani was powerfully contracted; the finger could enter the rectum, however, and there came in contact with a hard and long body. The contraction of the sphincter caused all attempts at removal to fail. Raffy then slit the sphincter with the blade of a bistoury, and the finger could then penetrate into the rectum. A hard, elongated body was found, with a rough surface, and appeared to be imbedded in one of the rectal folds. It was not without difficulty that a wooden rod, as large round as the little finger, was carried down with the aid of two fingers, but it was impossible to withdraw it to more than a centimetre outside the anus. This end being held by an assistant, Raffy followed the rod with the index finger, and came in contact with another which appeared to be joined to the first at an acute angle. It was very difficult to disengage it and to bring it into the axis of the rectum. After approximating the two branches, a perfectly intact wooden fork was removed. The two branches, as large as the little finger, were separated to the extent of seven centimetres, and one of them measured eight centimetres, the other seven.

"The removal of this body was followed by a profuse discharge of blood, which was not, however, of long duration. The patient finally recovered after a long convalescence."

Such an incision guarantees us a large space without great risk. However, it did not suffice in Studsgaad's (of Copenhagen) case; he was forced to perform gastro-enterotomy.[1] But before resorting to this extreme measure, we should follow the advice laid down by Verneuil, and perform resection of one or two of the coccygeal vertebræ, or even imitate Turgis' plan and make a flap with the écraseur, extending from the anus to the lateral portions of the coccyx. This surgeon was able, in this way, to remove a coffee-cup with facility.[2]

2. *Large and non-fragile foreign bodies.*—The peculiar characteristics which they present are due, on the one hand, to the relative narrowness of the sphincter which, contracting upon itself, opposes the passage

[1] Société de chir. de Paris, 1878. [2] Ibid.

of a large body. In all these methods, therefore, we endeavor to dilate the anal orifice sufficiently and even, in case of need, to slit it up behind, and in addition to facilitate the prehension of the foreign body.

A. *Extraction with forceps after dilatation.*—In such cases we use ordinary strong forceps and lithotomy extractors, the blades of which are capable of grasping large bodies. Articulated forceps, like that of Farabeuf, enable us to graduate the separation of the blades according to each individual case. The operation is performed in the following manner: in the first period, the anus is dilated with the aid of the fingers, a dilator, or an incision, if necessary; in the second, the forceps are introduced along the left index finger up to the foreign body, which is withdrawn gently by performing lateral and rotatory movements in order to effect a passage without injuring the parts.

Observation by Gillette.—"An individual had introduced into the rectum a piece of the handle of a shovel used in putting bread into the oven, the fragment being 22 centimetres in length and four in width. Its lower extremity had mounted 8-10 centimetres into the rectum, and it could be felt upon palpating the left iliac fossa. There were no abdominal symptoms, but very marked urinary disturbances. The foreign body was removed with the aid of forceps, and the extraction was followed by the discharge of a fetid fluid. Recovery." (Soc. de chirurgie, 1877.)

The forceps are useful in such cases, because we need not fear the wounds caused by the fragments. But all foreign bodies cannot be extracted in this manner, either because they are too adherent or too large. But it is, I believe, our only resource when the bodies are large, rounded stones which cannot be broken or perforated. Finally, we must mention the employment of the hand, which can render the body movable and bring it close to the anus, so that it can be grasped. Resort was had to this measure, in a case reported by Duval, in order to extract a wooden pestle twenty-three centimetres long. It was extracted from the rectum, but not without great difficulty, with one hand, while the other pressed upon the projecting extremity under the abdominal walls in order to keep it in the axis of the intestine.

B. *Use of hooks.*—Any sufficiently resisting hook may be used for extraction. These instruments act *a tergo* by pushing the foreign body from above downward. But they necessitate their introduction above the foreign body, a manipulation which is not always effected without danger.

C. *Use of the gimlet or turrel.*—If the foreign body is so firmly fixed as to resist traction, or if it is impossible to seize it, we will find it useful, if its composition will permit, to employ a gimlet or turrel, the instrument being introduced by gliding it along the left index finger. The turrel with a canula, which protects the adjacent parts, will advantageously replace the gimlet. In all cases we must use moderate pressure, proceed slowly, and not go beyond a few centimetres. When the foreign body is firmly fixed, we may use the wire of the turrel in order to exercise traction. Saucerotte reports a curious case in which this plan worked excellently.

Observation.—"A man introduced a wooden peg 3 inches long and 2 inches in diameter deep into the rectum. Colic, abdominal tension, fever, constipation, and difficulty in micturition developed and lasted six days. The impossibility of extracting it with forceps suggested the idea of using a gimlet, which, being introduced with the aid of the finger in the rectum, was deeply imbedded into the peg in order to withdraw it, though this was not done without causing severe pain." (Saucerotte: Mélange de chirurgie, p. 448.)

Observation.—Pepper-box in the rectum (Soc. méd. de la Suisse romande, 1878). "An individual, æt. forty years, had introduced a wooden pepper-box, 6 centimetres long, 5 in width at the bottom, and 3½ at the top. Despite his having indulged in this habit for twenty-five years, such severe symptoms occurred in less than twenty-four hours, that he was compelled to seek assistance. All attempts at removal, by means of forceps and curved spoons, proved useless. A piercer was then used, care being taken to keep the body fixed with one finger, and the pepper-box was then pulled down and was discharged with force and with a detonation."

D. *Fragmentation.*—If the previous methods are unsuccessful, it would be well to break up the foreign body, if possible, by means of Liston's shears. But this method is very rarely applicable when the body is large. In extreme cases we must freely incise the anus posteriorly, make a large opening, and introduce a hook behind the foreign body.

II. Regular and Pointed Foreign Bodies.—Two cases present themselves: the foreign body has either perforated the rectal walls, or it has produced no lesions. Digital examination and the functional symptoms furnish the most valuable data in this regard. As the plan of treatment differs in the two cases, I will successively pass in review the following measures:

A. The Pointed Foreign Body has perforated the Walls of the Rectum.—This perforation presents numerous varieties, which may be arranged in two principal classes, according as the perforation is single or double. It is single when only one extremity of the foreign body has been forced through the walls, and double when both ends of the foreign body, situated obliquely or transversely, have passed through the walls of the organ.

1. *Single perforation.*—In the first case, four plans are at the disposal of the surgeon.

1*st plan.*—The foreign body being seized with a pair of forceps, we complete the perforation which was begun by making the point of the object perforate the skin of the ischio-rectal fossa or the margin of the anus. If the extremity meets with difficulty in perforating the skin, we can aid its exit by making a small slit over the projecting foreign body, which is held by an assistant. This simple measure should not be adopted unless the extremity is pointed and its direction is almost vertical, in order to avoid passing through the adjacent tissues at too great a distance from the anal orifice, and thus perhaps giving rise to severe inflammatory disturbances. Rothmund (Deutsche Klinik, 1859, No. 15) has reported a case in which the removal was performed in this manner.

Observation.—"An individual had swallowed an iron cylinder, 25 centimetres long, which occupied 19 days in reaching the rectum without any serious symptoms. When it arrived at this point, it produced tenesmus and pain. The finger, being introduced a distance of 3 centimetres, came in contact with the piece of iron, which had perforated the wall of the rectum. With a strong pair of forceps it was pulled down still further until it projected beneath the skin. It was readily extracted by an incision made at this point about an inch from the anus. The fistula healed up promptly."

2*d plan.*—Disengagement of the inferior perforating extremity from below upward, and simple extraction.—This heading indicates all the advantages which can be derived from this ingenious measure. It is performed with the aid of a finger and a pair of forceps introduced into the rectum. In the first stage of the operation the surgeon seizes the foreign body with the forceps, and disengages it from the perforation by pushing it upward. He discontinues this movement when he feels that the lower extremity of the object is free. In the second stage it is ex-

tracted from above downward with the forceps, the foreign body being applied to the finger. Numerous cases have been successfully terminated in this way; the bodies were usually ordinary pins and needles. Reynold, of Philadelphia, performed this operation in order to extract a hair-pin which had perforated the recto-vaginal septum. He pushed back the vaginal portion of the pin, and then seized it in the rectum with a pair of forceps.

Observation.—"A woman introduced a large nail, 18 centimetres in length, into her rectum. An abscess formed in the buttock, opened, and the point of the iron projected through the orifice. This foreign body had been in the rectum for 8 months; it had pierced the rectum about 10 or 12 centimetres from the anus. The nail was withdrawn by means of a slip-knot snare passed around the head, after a slight incision had been made above and below."

Introduction of a second nail.—Relapse.—"She returned to the hospital. The orifice of a fistulous track was found 12 centimetres behind and outside of the anus, and 5 centimetres above the fold between the buttocks; from this projected a piece of iron at a distance of 3 centimetres from the old cicatrix. It could be pushed back somewhat upon pressure. As the head of the nail had become engaged, Dr. Vast disengaged it. By raising it in the rectum, the lower extremity was withdrawn from the fistula. The head was pushed upward with a long polypus forceps, and then withdrawn through the anus." (Mougin: Union médicale, 1871, Dec. 9th.)

3d plan.—Section of the foreign body before extraction.—The preceding measures presuppose that the foreign body may be freely moved in the rectum, as does happen when it is not too long. As soon as it attains a length of 8–10 centimetres, we must avoid pushing it upward, because we run the risk of perforating the walls in a very dangerous locality. In these cases, which are, however, very rare, it would be well to divide the body, and to withdraw the two portions separately by the previous methods. This section may be performed with Liston's shears, a cutting forceps introduced upon the finger, and the management of which (intrusted to the left index finger) presents no difficulty. Before performing the section, we must adopt the precaution of steadying both portions of the foreign body on each side of the point to be divided with a pair of forceps provided with a stop.

2. *The pointed foreign body has made a double perforation.*—This occurs very frequently when the foreign bodies are small, like needles, pieces of bone, the rib of a rabbit, etc., and are imbedded on each side of the rectum above the sphincter. In such cases we may: 1st, divide the intermediate portions, and simply withdraw the two pieces thus produced; 2d, disengage one end by imbedding the other end still more deeply. The latter plan is evidently more expeditious, because we can then extract the offending body, but it is somewhat more dangerous than simple section. Sometimes the first plan of action will be more convenient, and should be adopted, as in cases of ribs which are placed transversely; sometimes the surgeon will prefer the second, when the body is a pin or needle, which will only produce slight lesions.

B. The Regular and Pointed Body has not produced a Perforation.—I would have passed by this variety in silence, as it appears, at first sight, to be so simple; but an examination of the facts shows that great precautions must be used, even more than in the simplest cases, in order to render the object movable, when it is very long, and in order to avoid imminent perforations. If the pointed body is not very long, we can seize the lower end with strong forceps having a flat end, and upon them we can pass up a gorget of ebony, or a curette, in order to push back the

upper end of the object. The manipulations which are often necessary in order to render the object movable then become harmless, and extraction is more ready. There is no necessity of taking this precaution if the foreign body is vertical and movable, and it is only in the opposite cases that it must be resorted to. Whenever too great difficulty is experienced the object should be rendered steady, and then divided.

In a case of a very long body, such as is sometimes observed, Scarpa followed a very rational course, which enabled him to overcome the difficulties opposed to the straightening of the sigmoid flexure and the deviation of the organ by the foreign body. His plan should be imitated in analogous cases.

Observation.—A man had introduced a small stick into the anus. The body ascended and one end projected under the abdominal walls. Scarpa thought that it must be placed obliquely in such a manner that the upper end pushed the abdominal walls outward in the left iliac region, while the lower end projected into the rectum and was driven back toward the right side of the pelvis. Having placed the patient in the position for the operation for stone, he introduced into the rectum, upon the left index finger, a rubber canula as large as the ring finger, deprived of its metallic mandrel, so that it was flexible in all directions, could insinuate itself into all the curves, and depress the angular fold made in the intestine. He then pushed into the canula a metallic mandrel, curved at the end, which gave the canula the necessary rigidity. Then the palm of the right hand being pressed over the left iliac region, he began slowly to push the upper end of the stick from left to right and a little upward toward the umbilicus, while with the left hand seizing the canula and directing it in the opposite direction, that is to say, from right to left, he forced it to efface the angular fold. Little by little the stick was lowered and was withdrawn with a crane's-bill forceps.

III. Extraction of some Irregular Foreign Bodies.—The preceding rules will not apply to some strange cases in which very irregular foreign bodies are found in the rectum. In truth there are no didactic rules of action, but illustrations of the ingenuity of surgeons will ease the task of those who are by chance called to treat these cases. When a foreign body is irregular and presents numerous rough points which impede extraction, we must search for measures which will preserve the rectum from their irritating action. It is with reference to this point that we quote the case (which has become historical) of the pig's tail extracted by Marchettis from a woman's rectum :

Observation.—Pig's tail extracted from a woman's rectum.—Some students had formed the plan of playing a practical joke on a prostitute; they determined to push into her anus a frozen pig's tail. They cut the hairs very short in order to make them sharper and rougher, then dipped it in oil, and forcibly introduced it into the woman's anus, with the exception of a portion, three fingers' breadth in length, which remained outside. Several attempts were made to extract it, but, as it could only be withdrawn against the hairs, the bristles entered the rectal mucous membrane and gave rise to excruciating pain. In order to relieve it, various oily remedies were given by the mouth and the attempt was made to dilate the anus with a speculum, in order to extract the tail without violence, but it was unsuccessful. Severe symptoms developed, violent vomiting, obstinate constipation, very high fever, and intense pains in the abdomen. Marchettis was summoned on the sixth day. This physician, having been informed of what had happened, invented a very simple and ingenious device. He took a hollow reed, one end of which he prepared so that he could easily introduce it into the anus, and completely enclosed the pig's tail in this reed in order to withdraw it without pain. For this purpose he attached to the tail, by the end which projected from the anus, a stout waxed thread which he passed into the reed. With one hand he pushed this form of canula into the rectum and held the wire with the other, in order to prevent the tail being pushed in still further. He succeeded in completely en-

closing the tail, and promptly relieved the patient. Discharge of fæces, which had been retained by the foreign body for six days. (Hevin, p. 339.)

Without doubt there are very few occasions in which the surgeon will be called upon to treat such singular cases, but he will find it useful to remember these exceptional occurrences and to modify his plan according to the inspiration of the moment. Cases like the following one will sometimes be observed because, the object introduced, a fork, is in common use, and sometimes is used as an instrument of suicide. We should follow the plan which was adopted on this occasion:

Observation.—Extraction of a fork from the rectum.—"A young man, who meditated suicide, introduced a fork into the rectum. The violence of the pains which he suffered when he attempted to defecate soon compelled him to seek assistance, and he therefore entered the Hôtel-Dieu. The index finger, passed into the rectum, detected the prongs of the fork at a distance of two inches. It was readily seized, but the slightest traction caused it to penetrate the walls of the rectum, and expulsion was impossible. One thing remained to be done, viz., to compress the prongs of the fork and to unite them like a single rod. The operation was performed with the aid of forceps, and the foreign body was then readily withdrawn. (Gaz. méd., 1835.)

If such an accident presents itself, I think it would be preferable to attempt Marchettis' plan of seizing the foreign body with a forceps having a bolt, and passing it entirely into a cylindrical speculum, if necessary into a glass chimney. No great difficulty was experienced in an analogous case, published in a German journal:

Observation.—A widow, æt. 28 years, pretended to have swallowed, six months previously, a fork in a mouthful of sourkrout, in accordance with the wicked advice of her husband, who died shortly afterward. Three teeth of the fork projected from the rectum. It was merely necessary to disengage the fourth one by a small incision, and the fork could then be withdrawn. Only a small part of the handle was attached to it, the whole being five centimetres long. (J. für chir. Geburtshülfe: von Loder, 1802.)

When a foreign body in the shape of a hook is introduced, the point of the hook being uppermost, ordinary extraction is impossible. Such an accident has been observed on several occasions, and surgeons have solved the difficulty in various ways. Some have cut one branch of the fork by means of cutting forceps or Liston's shears. Velpeau[1] advises for this purpose the use of a narrow saw, such as Larrey's handsaw, protected by a gorget and by the index finger. Others, in order to prevent tearing of the mucous membrane by one of the points of the fork, have placed upon one of them (usually the upper) a blunt body, such as a gorget or a pair of forceps, while the other portion was directly withdrawn. Finally, Thiaudière succeeded in extracting a wooden hook by means of the hand, which enabled him to isolate the hook from the rectum and to withdraw the foreign body. The body to be extracted was a large wooden fork, five inches long, which a young man had introduced in order to relieve his obstinate constipation. In order to perform the operation, the surgeon had placed the patient on his feet, the hands resting on a chair, the thighs separated, and the buttocks slightly elevated. The fingers were introduced in succession. This foreign body had been in the rectum for twenty-five days.[2]

Side by side with these ingenious measures we must place the use of

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[1] Méd. opér., T. IV. [2] Bull. de thérapeutique, T. VIII., p. 29.

the electro-magnet, which proved successful in the case of a metallic foreign body.

Observation.—An upholsterer had swallowed some small nails; this was followed by obstruction in the pharynx and pains in the stomach. The nails were extracted from the rectum by the aid of a magnet. (Union médicale, 1859.)

But this plan is more curious than useful, and I doubt whether it will be often employed.

Treatment after Extraction.—After a foreign body has been extracted from the rectum, the treatment to be pursued is very simple. We should advise rest in bed, and administer an antispasmodic in order to relieve the acute pains which result from the inevitable rupture of the anus and rectum. Bonnet advises bleeding, which has proved useful in some cases. On the following days we should make some emollient injections, lukewarm, if no sanguinolent passages have occurred, and cold, if blood continues to escape, as sometimes happens. Finally, in cases of invagination, the mucous membrane should be retained in place by means of a large plug of lint. In the majority of cases the symptoms disappear immediately, and the health is re-established, unless some more serious complication interferes with recovery.

Results of Extraction through the Natural Channels.—The numerous cases quoted in the course of this work demonstrate the real efficacy of extraction through the natural channels, and I am inclined to believe that the skill of the surgeon has a great influence upon the results obtained.

For the purposes of facilitating extraction, I have taken pains to give full details with regard to the measures which may be adopted. The number of cases in which extraction is impossible or dangerous is relatively rare.

Nor can we share the views of those contemporary surgeons who, without sufficient proof, state that many patients, from whom foreign bodies of the rectum have been extracted, have died in consequence of the operation. It is not just to attribute to the extraction the injuries and accidents which are the result of the presence of the foreign body itself. Furthermore, a study of the cases shows that these examples of unfortunate terminations are much rarer than has been stated. What are these accidents? They include pelvic phlegmons, peritonitis, hemorrhages, etc. The latter is not the least important, and it sometimes precedes the appearance of the peritonitis, as in the following example:

Observation.—A porter, about 40 years old, was shut up in a lonely house in Madrid, seized by three men, who threw him upon his belly on a bench, his feet and hands being bound, and a hard body was then forced into his anus. This being done, they unbound him, carried him into the street, and laid him at the foot of a wall, where he remained unconscious until two of his fellow-workmen accidentally happened to pass by. They placed him on their backs and carried him home, where he lived with two compatriots, to whom, however, he told nothing of what had happened. He was put to bed suffering from pains in the anus, but it was not until the lapse of six or seven days that he decided to enter the hospital on account of the continued increase of the pain.

General malaise, moderate fever, insomnia, anorexia, pains in the abdomen radiating into the groins and developing with every movement of the patient in bed, were the apparent symptoms of the disease. There were no marks of violence around the anus; upon touch, the two sphincters were found to be intact. Above the sphincters, a hard body could be felt, the surface of which was alternately rough and smooth, but it was impossible to determine whether it was wood or stone.

In order to extract the foreign body, the patient was laid upon the left side; it was

impossible to extract it with the hand, as it was not even movable. The employment of forceps and the spoons used in lithotomy gave no better results. No other resource was left but the incision of the sphincters and the lower part of the rectum, with the aid of a straight probe-pointed bistoury introduced along the left index finger up to the foreign body. After this incision the object became movable; it was then found that the body was placed transversely in the rectum, thus explaining why extraction of the foreign body as a whole was very laborious. The hemorrhage during the operation did not require a ligature, and was arrested by the tampon. But a suppurative inflammation developed in the pelvis, leading to the death of the patient four days after the extraction of the foreign body, which proved to be a wooden instrument, made of black poplar, and known under the name of *parte-piñones.*

According to the annexed figure, this instrument consists essentially of two branches, 5½″ long and 7‴ wide, terminating in a point at their free extremities, but connected with one another at the other end by an articulation 2‴ long.

The elastic construction of this articulation enabled the two branches to approach one another in such a manner that they became parallel. According to Luque, the joint of the instrument was introduced first, the branches being closed. In the interior of the rectum they separated and were placed at a right angle.

At the autopsy, the intestines, especially the large intestine, were found of a bluish color; the markedly dilated walls of the rectum were inflamed, and this degeneration extended into the neighboring regions. Furthermore, there were two perforations in the rectum. (Schmidt's Jahrb., 1864, p. 214.)

But facts of this kind could be readily opposed by a large number of others in which, despite the very severe symptoms caused by the foreign body, extraction was followed by recovery. To the cases previously mentioned, I will add the following, which demonstrates the utility of surgical interference:

Observation.—"An individual introduced an ale-glass into his rectum in order to satisfy his degraded passions. In the attempts which he made at removing the glass, it broke, and a hemorrhage resulted. Nevertheless extraction was accomplished, and the symptoms improved. Some time afterward the man introduced a glass carafe into the anus. The pains which developed led the unfortunate to conceive the idea of breaking the foreign body in order to remove it piecemeal. For this purpose he introduced into the rectum the handle of a fire-shovel. A considerable hemorrhage resulted from this manipulation; a surgeon, being called in, withdrew the pieces of glass with forceps and extractors, and no further bad results occurred.

In conclusion, extraction through the rectum is the only rational method in cases in which the foreign body is situated in the lower part of the organ; it should always be preferred to others, when it is accessible and the necessary manipulations are not too violent. The recent improvements in antiseptic methods also encourage such attempts.

Extraction by Gastro-enterotomy or Laparo-enterotomy.—The literature presents a small number of cases of extraction of foreign bodies from the rectum by means of an incision through the walls of the abdomen and intestine. In a recent paper, read before the Surgical Society of Paris, Studsgaard, of Copenhagen, presented a new and successful case of this operation, which must be added to two previous ones in medical literature; one of them was not mentioned by this surgeon.

The oldest known case was reported by Réalli and occurred thirty years ago, the foreign body introduced into the anus being a piece of wood. I think it will be well to republish his case.

Observation.—Gastro-enterotomy performed in order to remove a piece of wood introduced into the rectum.—On the 18th of Dec., 1848, a peasant was brought to the hospital of Orviéto in a condition of extreme weakness. Nine days previously, having hit upon the ingenious idea that, if he prevented the discharge of food he could limit the quantity to be swallowed, he introduced a piece of wood into the rectum; all his attempts at removal only served to push it in still further. The finger could only touch

the end of the object, and it was firmly fixed in such a manner as not to yield to any tractions which could be made upon it with such a slight purchase.

After the failure of all the attempts at removal, the foreign body completely obliterating the intestinal cavity, and the patient being threatened with death from his atrocious sufferings, Réalli decided to operate. After having cut the abdominal walls on the left side, he could distinctly feel the stake in the descending colon. He desired to push it down to the anus, but the attempts proved unsuccessful, and he was compelled to incise the intestine. Only after this was done could he remove the body, which was ten centimetres long and more than three centimetres in diameter at the base. The point was rounded and very soft. No fæces were retained above this plug, but the mucous membrane was blackish, the peritoneal coat strongly injected, and the thickness of the intestinal wall markedly increased.

The wound in the intestine was united by a suture, which was applied according to Jobert's plan. The lips of the wound in the abdomen were united by means of an interrupted suture. Cold and then iced applications were made over the operated region. Two doses of castor-oil were administered. There was a purulent discharge from the anus. During the first few days the tumefaction of the walls of the intestines prevented the advance of fæces, and caused meteorism and vomiting. Three bleedings, two applications of leeches, and a few doses of castor-oil put an end to these symptoms, which had acquired an alarming character. The evacuations from the bowels were again passed on the fifth day. Toward the fourteenth day the wounds had cicatrized. Two years later the health remained perfect. (Bull. dei Sc. Médish, and Gaz. méd., July, 1851.)

The following case,[1] reported in the "History of the American War," is even more interesting than the preceding; it is to be regretted that the report is so concise. The observation was made upon a sailor, æt. 45 years, who had introduced a piece of stone, five inches and a quarter long and three wide, in the rectum during an attack of dysuria. The colon had been perforated, and the foreign body was extracted from the peritoneal cavity by an incision in the umbilical region.

Finally, Studsgaard's observation is one of the most interesting, both on account of the minute details and of the happy results following laparo-enterotomy.

Observation.—Bottle of mushrooms in the rectum.—Laparo-enterotomy.—Recovery.—J. F., footman, æt. 35 years, was admitted on January 10th, 1878, to the Copenhagen hospital, and left cured on April 16th, 1878. The night before entering he had introduced an empty mushroom bottle into the rectum, the neck of the bottle being uppermost, in order, as he stated, to relieve a rebellious diarrhœa, and on the morning of January 10th he was obliged to call a physician, acute pains being experienced in the abdomen.

He was anæsthetized with chloroform, but the bottle, which, previous to the narcosis, had been felt in the rectum, slipped further up. He was exhausted by the passage and the increasing pains; vomiting of mucus. The bottle could be felt through the somewhat tense abdominal wall along the median line on the left side, the bottom being near the horizontal ramus of the pubis. In the evening profound narcosis and posterior linear rectotomy; the hand was introduced as far as the third sphincter, which was not forced on account of its resistance. The bottle was then pressed from the outside down into the pelvis, but it descended in a loop of the intestine in front of the rectum. Immediately afterward, antiseptic laparo-enterotomy through the median line by an incision ten centimetres long, commencing at the umbilicus. A loop, which was thought to be the sigmoid flexure, was extracted, and the bottle was then slowly removed through an incision. four centimetres long, which was made upon the orifice and upper part of the neck. The entire circumference was protected by sponges and compresses between the fæces, and the intestinal incision was closed by twelve to fourteen catgut sutures, according to Lambert's method. the peritoneal surface having been freely washed. In order to be on the safe side, the sutures were tied with three knots; the intestines were then introduced, and the abdominal wound united with eight silk sutures, tied alternately with knots and the figure of eight.

The operation lasted an hour.

[1] T. II., p. 322.

The bottle was seventeen centimetres long, the diameter of the bottom was five centimetres, that of the neck three centimetres; the opening contained a notch, which was evidently of old date, about half a centimetre long, and presenting cutting edges. The recovery occupied a long time, and the prognosis was uncertain for a very protracted period on account of a local peritonitis with abscess formation, which I incised both upon the median line and through the rectum, upon the posterior wall of which it projected. Gas began to pass two days after the operation; from the ninth day on he had spontaneous evacuations, which were well formed and contained no traces of pus. (Soc. de chirurgie de Paris, 1878, p. 662.)

In the three examples which the literature presents, the operation terminated favorably, But, despite this happy beginning, it must not be forgotten that its indications are very restricted.

Gastro-enterotomy should only be regarded as a last resource, in cases in which the foreign body is situated so deeply as to be beyond the action of the hand and of instruments. It would be impracticable and useless in those which are situated in the lower portion of the rectum. It exposes the patient to danger of peritonitis and extravasation of the intestinal contents more than the manipulations of extraction, because it is impossible, on account of the anatomical arrangement of the parts, to render the sigmoid flexure movable and to avoid extravasation of some part of the very dangerous fluids which have accumulated above the obstacle. If an artificial anus is formed, a serious infirmity results, which is difficult to cure. If we reduce the sutured intestine, as Studsgaard did, we expose the patient to great danger of peritonitis. Under such circumstances the condition of the peritoneum and intestines must guide the surgeon with regard to the course to be pursued. If the intestine is inflamed or presents traces of gangrene, we must make an artificial anus; if it is healthy, on the contrary, reduction should be performed. The intestine presents better chances of being in such a favorable condition the sooner we operate, and for this reason I think, as the Danish surgeon did, that it should be decided on promptly without waiting for the appearance of symptoms of obstruction or peritonitis.

Finally, where should the operation be performed? The place of election is evidently variable, and depends upon the part of the sigmoid flexure or colon occupied by the body. I exclude the rectum, because the objects found there are accessible to the hand or instruments. If the body is situated in the sigmoid flexure, we should follow the advice of Verneuil and other surgeons by making Littre's incision in the left iliac fossa. But where should the incision be made in order to open the colon? If there is a projection at the level of the false ribs, this will serve as a guide. If there is not, we must open at some point which will be determined by the introduction of a long œsophageal sound into the rectum until it comes in contact with the foreign body. By adopting this precaution, the surgeon will very closely approximate the part which contains the object. We see, therefore, that there is no definite incision, and, in any case, I do not think that the incision proposed by Studsgaard along the median line is the best. It is equally remote from all parts, but it is too distant, and I doubt whether it will enable us to extract a foreign body which occupies the end of the descending colon or the beginning of the mesocolon.

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